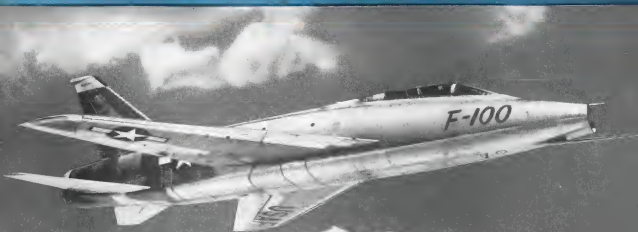


AVIATION WEEK

A MCGRAW-HILL PUBLICATION

FEB. 7, 1955

50 CENTS



New Honeywell E-10 Autopilot helps fly the F-100 Super Sabre

THE extremely high performance characteristics of North American's new F-100 Super Sabre—plus the precise missions it will be required to fly—demand an entirely new high performance flight control system.

Honeywell is proud that its new E-10 Autopilot was selected to help fly the autopilot equipped Super Sabres.

Here are some features of the E-10 which make it an outstanding flight control system:

Mission matching adaptability to a wide variety of command signals—fire control, blind landing, cruise control, radio navigation.

Extremely rapid response of hydraulic servos.

Fully coordinated three axes stabilization.

Constant mach control in dive, climb or cruise.

Complete air speed compensation providing uniform response at all air speeds. Control stick steering.

All-attitude maneuverability.

Components that make up the E-10 can be combined into highly effective control systems for dive bombing, interception, level bombing or normal cruise control for any high performance aircraft.

The new E-10 Jet Autopilot is another new development from Honeywell. There'll be more, for automatic control is so important to aviation's progress. And automatic control is Honeywell's business.

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1/3 the weight of comparable standard anchor nuts
with maximum strength and the
utmost in locking dependability



Check these features:

- Superior strength
- Highest axial strength
- Lowest weight
- Most convenient handling
- "Tubular" flexibility
- Impervious to damage by cross-threading
- Only one part required for both 550° F. and 600° F.
- No torque required
- No low temperature restrictions



Now available in a
new size range of
diameters .05-.42 to
.1714-.34 in 4 basic
configurations

Repeat here are also available in standard sizes nut, washer nut and
grip channel configurations, are available products produced in full
conformance with Air Force-Military specifications MIL-30-1 and MIL-30-1A.

RESEARCH KEYS

B.F. Goodrich

FIRST IN RUBBER



How we keep a flying LST's nose out of trouble

THIS new Cavite RM-2 is the Navy's reborn version of the LST. It's designed to load and run right up to a beach. Then lift its nose to load or unload tanks, guns, trucks and even small crafts. In the early stages, one would be a problem.

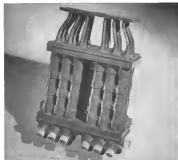
The bow loader's nose had to be air-tight for flight, watertight for take-offs and landings. Yet it had to open easily and quickly. Some kind of a seal was needed. But what kind? For the answer, B. F. Goodrich engineers came up with an ingenious seal built inside a U-shaped solid rubber boot.

The 16-foot seal is attached to the nose where it joins the plane. When the nose is closed, a diaphragm that runs inside the rubber boot is inflated. It fits against the plane's body to make a 100% seal. It's like blowing up a paper bag. There's full expansion without stretch. Dangerous stretching of the seal will (like blowing up a balloon) is prevented. Deflated, it instantly returns to its original position.

Engineers met on the shores of San Diego Bay and without a hitch. A seal could get on, get air and water could not. A fleet of these flying LST's will see service in 1955.

That inflatable seal is another example of B. F. Goodrich's leadership in innovation, research, design and development. Other B. F. Goodrich products for aviation include tires, wheels and landing flaps, landing rubber, pressure landing flaps, fuel cells, Arcon, Evers, tires and accessories. If you have a design problem, write or phone: The B. F. Goodrich Company, Aero-nautical Labs, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER



New Oil Cooler Design

A Clifford unit is first to use the vaporizing principle in tube oil cooling service. Developed for the Westinghouse J46 turbojet engine this oil-cooled heat exchanger provides more heat rejection capacity per unit of fuel flow than ever previously attained.

How to provide sufficient heat transfer capacity in a small space—and at full flow rates for low fuel economy when the law for ordinary air-cooled engine designs was the problem when Westinghouse developed its J46 turbojet engine.

Previous engine used fuel at rates that provided no adequate flow for oil cooling, but burned approximately in the J46 mode necessary for development

of a completely new type of cooler that would provide higher cooling while requiring substantially less fuel flow to carry off the heat.

Based on the solution of this problem was Clifford's specially heat exchanger technology—the largest, most completely equipped technical facility in its field. Chemically stable, continuously developed over many years plus the



This designer of wind tunnel control panel, located in a room, from completely automated mode.



Jet engine oil-cooled heat exchanger (non-vaporizing type) undergoing test (bottom left).

ability to duplicate actual engine conditions produced in a cooler that was clearly not the requirement.

The answer was found in a special new design that had substantial increase in the heat exchange capacity in the latest heat of vaporization.

The new oil cooler, therefore, was designed to replace part of the fuel burner it entered the combustion chamber. Other aircraft heat exchanger problems for the engine oil cooling, liquid fuel system cooling and temperature control of cockpit, cabin and other components as well as design of engine and engine components have been solved at Clifford's unique Wind Tunnel Laboratory facility. A few of the resulting heat exchangers and their associated valves are shown at left.

Clifford's extensive capabilities will gladly assist you concerning your aircraft heat exchanger problems in developing solutions to all your requirements. Write: Clifford Manufacturing Company, Ltd. Great Street, Waltham 54, Massachusetts. Branch of Standard Thomas Corporation.



Typical group of aircraft heat exchangers and associated valves. Black represents the solution of a separate problem not meeting the requirements of the application as in respect, characteristics and military specifications where they are involved. Test



Air Force Ungrounds Modified Super Sabre

North American Aviation's F100 Super Sabre is being ungrounded as rapidly as a new vertical takeoff can be installed and modifications made to the modified engine to eliminate extreme yaw conditions (Aircraft News Jan. 17, p. 11).

The existing supersonic fighter has been grounded since Nov. 11, 1974.

"These modifications," Air Force says, "are being installed in existing F-100s and will be incorporated in F-100 production lines in time as possible." The aircraft is manufactured at NAA's Los Angeles and Columbia, Ohio, plants.

Domestic

NAVJ-3 convertiplane, Bell Aircraft Corp.'s taking over military design, will roll out of the company's Ft. Worth plant Feb. 10. Developed under a joint Army-USAF contract, the experimental aircraft resembles a conventional monoplane with rotors added to wings.

Earl D. Johnson is managing in president of Air Transport Assoc. 36,000 General Dynamics Corp. at a senior vice president, Johnson, head of ATA for a year, will continue with the scheduled aircraft separation until a successor is appointed. This is expected to take about two weeks.

North American F4J-1 are set in an official challenge to the F-16 of General Dynamics Air Station near Norfolk, Va., attacking from a standing start to 10,000 feet in 12.2 seconds. The Navy jet flying, piloted by Lt. Grade Wilcox I. Minkley Jr., landed, an F-16 second mark set two days earlier by an FJ-3 at San Diego.

Continental approach system will be installed by Civil Aeronautics Administration on New York International Airport's Runway 4, replacing the double now approach involved in the crash of an Italian Airbus DC-404, Dec. 18 (Aircraft News Dec. 27, p. 7). Construction is scheduled to begin Mar. 1.

Texas Aircraft Corp. has sold rights to the Luscombe Sabre, two and one-half place, line of personal lightplanes, to Otto F. Mueny & Associates, Ft. Collins, Colo. The Dallas Sabre builder assigned the Sabre when it purchased Luscombe Aircraft Co. in 1970, but over the light craft was produced.

Scheduled airline industry plans to open six transports with nine trans-



New Convertiplane Starts Transition Trials

First test of Transcendental 1-G convertiplane have been third forward about 30 deg. in test phase of full transition test being conducted by the firm at New Castle, Del. The single-engine prototype is shown with rotors in vertical flight position. The company notes converted back with rotors in vertical flight and that the forward flight on an elevated test stand (Aircraft News Jan. 17, p. 11). North American Aviation Corp. recently moved its design and engineering facilities to Tulsa, Okla. Ft.

power because for positive identification, such as the aircraft's position. The program, expected to cost a total of \$5 million, was set up by representatives of 31 airlines at an Air Transport Association meeting in Indianapolis.

Reed Adam, Apollo South, that at the Navy's Bureau of Aeronautics, at 21 at the Naval Medical Center, Bethesda, Md., and it is expected to return to duty. He has been in the hospital for more than two months. Reed Adam, David Harrison, deputy chief of staff, will handle the bureau's budget presentation before Congress.

Procter & Whitley Aircraft is taking over the Boston expanding office of Chatterbox Aircraft, now with drawings to consolidate all operations at Dallas. P&W will employ about 200 engineers, draftsmen and clerks. Approximately 100 persons employed by Chatterbox Aircraft in Boston have been asked to join Procter & Whitley.

W. W. Wadsworth, 57, president of various airlines, including Eastern Airlines, Inc., died Jan. 28 in New York.

Financial

North Coast Airlines reports a record net profit of \$115,049 for 1974 and an all-time high operating profit of \$178,859. The carrier lost \$114,558 in 1973 and continued to lose an average of \$57,680 monthly during January, February, March and April of last year.

General Dynamics Corp., New York,

has declared a 380% common stock dividend and increased its quarterly cash payment from \$1 to \$1.50. Both will be paid Mar. 10 to stockholders of record Feb. 23.

United Air Lines has declared a regular quarterly dividend of 25 cents on common stock, payable Mar. 15 to holders of record Feb. 23. A \$1.125 dividend on 40% cumulative preferred stock will be paid Mar. 1 to holders of record Feb. 15.

Aeromexicana Co., San Diego, will pay a 30-cent dividend on common equity stock Mar. 10 to holders of record Feb. 15.

International

Several European airlines ordered by Trans-Canada Air Lines was delivered last week at Montreal. The following transport will be sent to Toronto to join TCA and Capital Airlines crews.

British Airways Capital ordered approximately \$17,810,144 during 1974, dropping from \$118,363,536 in 1973. But various shipments of aircraft engines climbed to a new peak of \$58,357,935, compared with \$56,945,440 for the previous year.

First Douglas DC-60s this ordered by Lines Aerea Nacional de Chile has been delivered to the South American airline. The company plans to use the new transport on routes to Buenos Aires, Montevideo and Lima. It hopes to extend the Lima operation to Puno, Mexico and Cochabamba.



ADAPTED BY PHILIPPE L. B. FROM A PHOTO BY NATIONAL AVIATION SOCIETY

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ADHESIVES AND COATINGS DIVISION MINNESOTA MINING AND MANUFACTURING COMPANY

WHO'S WHERE

In the Front Office

Jerry B. Willis has been named executive vice president and general manager of Petroleum Aviation Corp., Los Angeles.

Robert E. Miller has been elected vice president and executive assistant to the president of Northrop Aircraft Inc., Hawthorne, Calif.

Paul J. Laffitte, former president of Wisconsin, is now president of Hamilton Electronics Corp., Little Neck, N. Y., succeeding Pauling Robinson, who resigned.

Warren C. Kirtland, former chief engineer at Northrop Aircraft, Inc., has been appointed vice president/manufacturing and engineering of Lingco Aircraft Co., San Jose, Calif.

Changes

J. Woodrow Thomas, former director of state affairs for Trans World Airlines, is the company's new director of civil affairs, Washington, D. C. W. T. Hall is assistant director.

J. O. Mason and J. W. Cisar have been named directors, respectively, of domestic and international commercial sales for Douglas Aircraft Co., Santa Monica, Calif. M. E. Olsson, Douglas division representative, also is a new director.

Kenneth Campbell is manager of Convair-Wright Corp.'s new Research Division, Wood Ridge, N. J., and J. V. Mize has moved up to general manager of Wright Aeronautical Division.

George Warren Dale is in charge of the recently opened St. Louis branch of J. W. Hall, Jr., manufacturer's representative. Robert McIlwain, former editor of Aero Digest, has joined Whelan Aircraft Corp., Bethesda, Md., in Washington, D. C., representation.

Charles R. Chappell has joined the public relations staff of Douglas Aircraft Co., Santa Monica, Calif.

Harold G. Martin, formerly with Grumman Aircraft Engineering Corp., has been named assistant editor of The Shop & Aircraft of the U. S. Fleet.

Honors and Elections

Harold C. Doolittle, president of Westco Air Lines, has received the first annual Aviation Scholarship Award of Harvard School of Business Club of Southern California for leadership in business without profit contributions to community development and success as a business career man.

Ernest G. Stout, still engineer at Convair-Saunders, is one of 100 alumni of New York University's College of Engineering honored for achievement that have brought distinction to themselves and their alma mater.

INDUSTRY OBSERVER

►USAF Air Research and Development Command now is studying the possibilities of including such factors as maneuverability, adaptability, maintainability and vulnerability in its design criteria for considering new aerial weapon systems.

►Airbus pilots are planning for a new safety device that will send permanent flap instructions by adjusting the rate at which flaps can be retracted to the performance that any particular aircraft can support during its takeoff and landing cycle. Inadvertent and premature flap retraction are usually avoided with cautioning the KLM Super Constellation crash at Shannon and the BOAC Strathmore accident at Pittsburgh.

►Watches for fuel storage in transport aircraft fuel tanks to become a major safety battle between Airbus pilots and aircraft manufacturers.

►Civil Aeronautics Administration is watching closely evidence of fatigue cracks in Douglas DC-6s. Although cracks have been discovered, CAA says there is no apparent pattern to their occurrence and does not regard the situation as hazardous.

►Sweden expects to be independent of jet engine imports by 1960 as the result of a new agreement between the jet firms and Svenska Flygmotor A. B. The Swedish aircraft engine company plans to spend about \$4 million on expansion of facilities.

►Improved traffic control in the New York area is expected to result from installation of new remote VHF station at Poughkeepsie, N. Y., which will extend the New York air route traffic control center's existing peripheral communication to it can talk directly with aircraft that are located almost anywhere on its control area.

►Autopilot-controlled "auto length landing" of a piloted F-4H (Aviation Week Jan. 24, p. 8) using a Lear F-5 has proven satisfactory, and its some prospects somewhat better when the plane is under manual control. Last report. A standard unmodified F-5 autopilot was used, despite high landing accelerations.

►Don't be surprised if the whole NATO fighter/interceptor project agreement without any action after working months in an apparently collaborative series of evaluations, NATO officials are confronted by two choices: they the existing Polaris Guard which was designed primarily as a high-altitude intercepter and has serious limitations as a low-level fighter/interceptor (possibly inability to carry heavy armor loads), or pick a French or Italian design that still on the drawing board and few years away from service use. While the North Atlantic Treaty Organization has followed away more than a year on this project without any tangible results, the Russians on the other hand, have just the MIG-17 fighter successor to the MIG 15 into sequence service.

►Army is buying 10 Cessna T-37A two-seat trainers, "a service test quantity" (Aviation Week Nov. 22, 1954, p. 48). The side-by-side aircraft is powered by two Continental 185, each developing 930 B. thrust. Speed is more than 190 mph. Army will use the aircraft in observation planes in adjusting radius-to-landing mode for.

►Two Republic F-84Fs have landed wheels up at Langley AFB without damage. Both came in on thick external fuel tanks; one pilot claims he didn't know he was wheels up until he got out of the cockpit. He thought he had a flat tire. The planes were jacked up, gear pumped down, fuel tanks changed, and returned to service.

►The Douglas B-66 develops you and picks up characteristics similar to those of the North American F-480 (see p. 7). Modifications are under way plans to deliver the three tactical bomber. Tactical Air Command wants to look for the B-66 if it is to move. They will need a fast, high-altitude refueling craft to refuel either B-66s or fighter bombers.

Hot Potato

Problems of what to do about Gas. C. F. Woylinda's Korean war book, "The First Jet Air War," is being bounced back and forth between the Department of Defense and the Air Force. Woylinda's book deals with the full story of the Korean air war.

Defense Department public relations wanted the book, promptly kicked it back to the Air Force and announced that "one final digester" had been made. Air Force is laying plans for another try at getting it cleared. Air Force, starting from Army and Navy proposals that it is almost USAP's role in Korea. Before the book, the former Air Force commander would set the record straight.

Besides tussling up the story of who did what to the Communists with weapons in Korea, Woylinda's book mentions the problems in training and equipment of the Air Force to either support at the start of the war, the world War II Communist war plans such as the theater split between North Corps and South Army and the losses known in the first year of war, including a critique of Air Force doctrine.

Woylinda, now Technical Air Command leader, is pushing the book. He wants it published only if he can tell the full history of the Korean air war. Members of his staff are being the book won't appear until after the review—it's too hot for the Pentagon to handle.

Tacan for Common System?

Probably that Air Navigation Development Board will take as first of the military's Tacan navigation and onto the civil VOR/DME system was intended in Washington observation as a reference pending action by Civil Aeronautics Administration.

CMA had issued a two-page advance press release on the VOR/DME program. Not only, CAA's press reports were being calling attention to the release. They advised in press.

Defense and CAA apparently agreed that Tacan would be distributed to civil about DME program (see full completed, with DME commenced at a program of 412 modifications) and later later that Tacan has been adopted in the civil military common system. Meanwhile, ANDB's decision on the DME-Tacan compromise is due immediately after a series of orders.

Postage Increase?

Postmaster General Alfred Sweeneyfield is using the assets of a recent Colley poll as a weapon to obtain an increase in postage rates this year.

Rep. Edward H. Ross, making Rangeland on the House Post Office Committee, wanted Colley's findings as the Congressional Record. They show that for the first time postage rates from air stations at 3 to 4 cents in first class mail, and as increase from 5 to 7 cents for airmail.

Navy Victory

What at first looked like a strong congressional drive to strip out Navy's budget for a fifth Ford-class class cutter apparently has died during.

Chairman Clarence Cannon of the powerful House

Appropriations Committee announced that he was up in the project to soon as it was proposed because it concerned common "too valuable and too expensive."

After Chairman Carl Albert of the Armed Services Committee reiterated his effort support for the new cutter, however, Cannon announced that he would not try to block Ford-class.

Subsidy in Service Mail Pay?

Sen. Harley Kilgore, a member of the appropriations subcommittee handling Civil Aeronautics Board funds, and possible in changing this year, is convinced that the service mail pay rates set by CAB contain a sizable element of subsidy. He will request that the Appropriations Committee have a special staff to look into the matter.

"If subsidy is justified for air transportation, I support it, but I don't want it going to another area," Kilgore said.

CAB Penalties

The Civil Aeronautics Board is going to conduct its campaign for the right to levy civil penalties for violations of its economic regulations. The Board wants to put some teeth into such regulation. Legislation to accomplish this is high on the list of bills that will be sent to Capitol Hill. Legislation was introduced last year, but it didn't get anywhere.

The Board also is going to ask for the power to issue certificates for "supplemental service." This is a move to do away with the long-time headache provided by the terms of regulation under which the airlines operate.

The Board never has managed to affect any real policy on the matter itself, although the huge antitrust suits, largely over personnel, is reported to be within a few months of an executive report. A decision on this one is supposed to decide just where the airlines fit in the air transportation picture.

Air Transport Monopolies

The air transport industry is expected to face in some form one anti-monopoly investigation in the course of Congress. The first committee to conduct itself as a study as to the nature of the industry is still open to completion. The Joint Committee on the Economic Report, headed by Sen. Paul Douglas, an influential Democrat on committee in Sen. John Sparkman, chairman of the Senate Small Business Committee and long-time proponent of the right of consumers to compete with the scheduled lines.

The two separate congressional committees can be oriented on to look into:

- Directly, policies concerning new entrants into the air transportation industry.
- Indirectly, the degree of dominance of Air America, Air West, Boeing (the latter Department) and again PAA and W. R. Grace and Co., seeking to divert the two firms from a number of Pacific, as high as be awarded by groups of Capitol Hill.

—Washington staff

- Symington warns Reds may be ahead in development of guided weapons, says airlift for Army inadequate.
- House subcommittee to probe Navy plane procurement early in scrutiny of Administration's defense program.

By Katherine Johnson

Congressional scrutiny of the Administration's defense program—expected to concentrate on guided missile development and airlift capability in the months ahead—opened with an investigation by the House Armed Services Committee.

Planned with an initial \$160,000, the committee's investigation into many facets of the program will be headed by a subcommittee, headed by Rep. Edward Rosten.

■ **Not Happy**—Already on the subcommittee agenda for early action on a series of bills to reform the military aircraft program.

This was outlined by Rep. Carl Vinson, chairman of the full committee following testimony by Sen. Symington, Charles H. Thomas and the "hot and cold" issue with it. Vinson's request for plant procurement costs dropped from \$8.9 billion for fiscal 1975 to \$7.15 billion for fiscal 1976, he said, because the expenditures and "bigger" in a program.

Although Thomas qualified his statement by saying difficulties had largely been solved, Vinson declared that "if we believe in the military, we must be kind and what he is saying about it."

Beginning in July 1975, Thomas and the Navy would require "greater increased obligating authority" for its contract.

The authorizing committee's draft "full and complete investigation and study of all matters" relating to:

- The procurement, use and disposition of personnel, equipment, supplies and services.
- Laws, regulations and directives administered by or within the Department of Defense.
- Research, research and development in support of the armed services.
- Rife AUSA—Memorial, in a speech on the Senate floor, Sen. Stuart Symington, former Secretary of the Air Force, expressed concern over the adequacy of the Administration's guided missile program and plans for early action.

He observed: "It may be the Congress needs about 100 times of greater devotion than we have, just as it may be they are ahead of us in the development of guided and ballistic missiles. After education, I believe they are ahead on missiles."

Pointing to a statement approved by the President that "the Administration is counting on a shift of Air Force to Marine units as an important part of the mobile force."

■ **Warning**—Symington added: "But I have studied the airlift over recent weeks and believe the airlift available to the Army is inadequate and Air Force, and so on."

■ **Warning**—Symington's House Armed Services Committee was launched at its second day of "briefing" sessions with top Defense Department officials and chiefs of staff.

■ **Congressional**—Symington's strong opposition to the Administration's plan to make deep cuts in the Army's strategic force "the Administration's program."

A decision in Army manpower from a strength of 1.5 million last December to 1.47 million, about a fourth reduction.

Committee members especially in question their intention to help the decision. They had the support of the Army Chief of Staff, Gen. Matthew Ridgway, but not of Army Secretary Robert Stevens, who strongly defended the Administration plan.

■ **Employment** and possible in the Administration program is on both strategic capabilities, power and continental defense.

They was put forth clearly in a Presidential statement presented by Defense Secretary Charles Wilson, Democrats, and numerous Republicans, and the Administration is following its plan.

■ **Stimulus**—Symington's statement, in a speech on the Senate floor, Sen. Stuart Symington, former Secretary of the Air Force, expressed concern over the adequacy of the Administration's guided missile program and plans for early action.

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Nuclear Aircraft

USAF chief of staff Gen. Nathan Twining told Congress.

■ **We believe we will reduce great advantages from the strictly nuclear propulsion program. While the nuclear propulsion program presents some difficult engineering problems, we believe that the advantages we have made to date have given us the best knowledge base from which we may project gainful applications for military weapons systems.**

■ **We have hopes that this will be a truly international system during at least the deployment of various legions. We have placed a high priority on the development of this program.**

recovered, then it is certain that any new hostilities will result in fighting on land.

■ **Current level of defense, including a fiscal 1986 budget of \$11.4 billion in new money and \$15.9 billion in expenditures, at the level that should be sustained indefinitely.**

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444 JETS VERTICALLY POSITIONED. Bell VTO test vehicle hovers a few feet off the ground during test program being conducted at Nager Falls (N. Y.) airport. Compressor on jet at tail and wingtip supply fuel/oxidizer, directional and lateral control.

Bell Jet VTO Takes Off and Lands Level

Bell Aircraft Corp. is flight testing a new turbojet-powered, vertical takeoff and landing (VTO) airplane that lifts up the air and lets down in a normal level attitude.

The new aircraft has made more than 70 flights since Nov. 30 at the Nager Falls Airport west of New York's Buffalo airport. It is expected to reach speeds up to 180 mph within the next few months.

A helicopter, lightplane, glider and other low cost contributed parts to the new

small design. Power comes from two White-Horshel J49 engines borrowed from USAF.

President Lawrence D. Bell says the VTO is "the most significant single development in aircraft flight since the Wright Brothers' first airplane."

► **Operations**—The Bell VTO takes off and lands in a horizontal attitude, with its jet pointing straight down. Control at the forward end of the flight spectrum is done with conventional

air jacks that are located at the wingtips and tail.

An engine jet control jet comes from a "Pulsator," a modified Turbo-jet engine whose inlet can be turned up and behind the plane's head. Converter controls take over for forward flight.

At the controls for the flights was David W. Stone, Bell's chief test pilot. ► **Test Vehicle**—The VTO differs from Bell's recent "Flying Bedstead" test jet in 37 or so structural aspects. Primarily, it is a more advanced aircraft than can be brought and built.

It was built as a test vehicle to prove theories. Construction was quick and cheap. The fuselage was converted from a glider, a conventional lightplane wing was adopted. The landing gear is from a Bell helicopter and the (engine from a scoutplane).

The VTO weighs about 2,000 lb., is 21 ft. long and has a span of 26 ft. There is room for the pilot only.

"Our test vehicle is only the starting point," added Bell. "Just as the helicopter brought new maneuverability and ability to attack, the jet-powered VTO brings in control, not only of forward flight."

USAF Gives Army Arctic Mobility

But Exercise Snowbird shows need for better aircraft equipment in true all-weather airborne operations.

By Claude White

Elmendorf AFB, Alaska—U. S. Air Force has passed an Exercise Snowbird test that it can provide the necessary vehicles for American reinforcements in sub-arctic conditions.

The next step is to perfect mobility of the troop carrier units themselves, a job that will call for full co-operation from the aircraft industry.

► **Operations**—Lt. Col. Marvin L. McNickle, commander of the 104th Troop Carrier Wing of the 11th Air Force, here from Scott AFB, Tenn., is satisfied that he delivered what the Army wanted in the right place at the right time.

The big lessons learned, he told American Press, are concerned with operations of the aircraft in sub-arctic conditions. The 114th dropped equip-

ment, supplies and 1,500 airborne troops in a snowbird exercise at Tallroset, 66 mi. north of this base near Anchorage.

Three battalions of the 11th Airborne Division's 501st Engineer, Cavalier, Team from Ft. Campbell, Ky., were parachuted accurately into the field with a new wave of supplies. The goal for USAF troop carrier units in true all-weather operational mobility. The Snowbird experience will help reach this goal.

► **Quick Moves**—Industry will have about it in specifications from the Air Material Command. A good parallel already known to weapons system contractors is Strategic Air Command's acceptance of the fact that a most operating today from Omaha, Neb., may be told it has 72 hr.

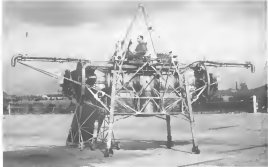
to make its operations in Greenland, Japan, Africa or Europe. SAC knows it

may be shifted in short notice to tropical, temperate or arctic regions, and immediately on ready to go.

Thus Air Force operational mobility now is equally necessary for troop carrier forces to some extent. They are operating today with equipment that was designed, not designed, to meet widely varying conditions. Exercise here from southern U.S., Col. McNickle's units were scheduled for a 12 hr. jump in Edmonton, Alberta.

The fleet of 70 Fairchild C-119s he flew had flown nearly 2,000 mi. and had about 1,000 mi. to go to Edmonton for Exercise Snowbird. Upon arrival at Edmonton the temperature was -117°. Average temperature for aircraft was scheduled to 17 hr., which means that some were put out of commission for at least two days. It was at Edmonton where the temperature dropped so far we had to wear our down-filled parkas," Col. McNickle said.

► **No Changes**—The trouble was not big for the unit, but, that time-consuming, broken down and hauled, fuel line broke, equipment malfunctions and engine troubles made jobs for ground crewmen.



Rolls-Royce Gives Closeup Look at 'Flying Bedstead' VTO

Close view of design details of Rolls-Royce vertical takeoff research vehicle shows installation of the two vertically opposed New turbojet engines with single turbine driven 50 in. diameter at the craft's center of gravity. Two fire and air intake are mounted ahead downwards to provide stability. The craft takes off from a central runway and can be sustained for 10 hr. It can fly horizontally in any direction at speeds of at least 14 mph. The

engine has been flying the vehicle at 15,000 ft. altitude. Rolls-Royce indicates that future development of the craft will require development for takeoff and landing and the horizontal flight, with the VTO version comprising a number of relatively small engines. Observe on the first's small size jet is a "horizontal" of such powerplants. These would be grouped in batteries to provide a reserve margin of power should one or more units quit



JETS ARE ROTATED from horizontal to vertical position for a steep climb. Jet for modified P-51 Mustang used for the test is a variable jet behind cockpit.

He was second experience by Maj. William A. Gibson, master chief at McNichols' command. He now knows what changes must be made in the engine and its many late installed, no common the aircraft fleet in the field.

The 10th Wing had an unprecedented fly-away test-run for each quad-engine at Edwards. Each test was 24,000 ft., engine test Weight 1315/180 engine, in addition to extra time, landing gear and all other parts that could be needed to maintain the planes for 30 days. Each squadron also had an engine test stand with parts that might be needed on the 3,500-sq-ft flight.

Maj. Gibson ran short of some items, particularly engines. Special checks on the power units were called necessary following four failures which resulted in forced landings or fuel cuts. To achieve the best possible operational flexibility for troop carrier planes, Maj. Gibson saw failures if only he were able to change the engine. Instead of a single fly-away test the engine experts indicate there should be three tests: a basic test, an engine replacement, a complete replacement. This would provide a type of "hot" engine replacement, not achieved under the present system.

► **Larger Aircraft**—The old weather demands, for example, probably will call for a possible shorter to facilitate engine changes and an improved ground heater in the support equipment. The heater must not require a generator for starting in legal temperatures.

Once and there improved operational mobility, Col. McNichols said the demand to larger aircraft for troop carrier operations.

The Lockheed C-119 four-engine turboprop that will head twice the load of a C-119 is a big step in the right direction, he believes. Col. McNichols says that it had worked, which would eliminate the need for the C-119's four engines, but the engine, however, is still in the air.

► **Engine Technology**—Major aviation advances developed at Edwards (Stowell) is the perfection by Army Engineers of the compact engine. At Edwards they have built a four-cylinder 3,000 in. long. Basic technique involves leveling and compacting the surface of the 40 in. of steel in the center of the 40 in. drive shaft. To make it dense and strong, the Engineers first pulverize and slightly melt the steel.

Compacting with a roller and continued adjusting gave a surface of uniform strength to support a lighter aircraft or medium transport. A strip of

Aviation Procurement Obligations

The three military services had approximately \$7.4 billion in unobligated funds for procurement of aircraft and guided missiles on hand Nov. 30. During the first five months of fiscal 1955, the services obligated approximately \$2.3 billion for aircraft and guided missiles.

The obligated figures include contract costs plus a small allowance of procurement expenses related to procurement activity. The figures are not reflecting gross obligations less contract cancellations.

The Obligations:

	AIRCRAFT						Unobligated Balance, Nov. 30
	July	Aug.	Sept.	Oct.	Nov.	Total	
Army	408	406	401	306.3	413	1,934	184.0
Navy	311.9	31.8	118.5	435.6	30.5	744	1,822.7
USAF	99.2	31.9	323.4	222.2	340.1	1,126	5,273.4
Total	819.1	469.7	842.9	964.1	783.6	3,804	8,480.1

GUIDED MISSILES

	July	Aug.	Sept.	Oct.	Nov.	Total	Unobligated Balance, Nov. 30
Army	2.1	345	189.0	0.6	18.0	554	310
Navy	4.2	9.40	6.2	32.7	17.6	60	340
USAF	7.3	815	11.1	34.3	12.3	83	294
Total	13.6	147	306.3	37.6	47.9	597	944

this type can be used for supply of ground forces or as a tactical base for fighter squadrons. Mass development in both Army and Air Force efforts on Edwards showed the six-manual weapon was used at Edwards during the drop. Last month was the second in 27 years for Alaska. At dawn on the day of the first paratrooper, temperature was only -5°F. The aircraft high was nearly 150°.

Army had expected temperatures in the neighborhood of -20°.

New Bristol Olympus Hits 11,000 lb. Thrust

(McGraw-Hill World News)

London—Thrust rating of 11,000 lb. thrust and continuous cruise power of 5,000 hp are claimed for the Bristol Olympus 101, making it the most powerful turbojet engine in the world, according to the British.

Yat, Dr. S. G. Hoskins, chief engineer of Bristol Aeroplane Co.'s Engine Division, says of the engine "As far as I am concerned, this is obsolete."

British will use the two-speed Olympus in production versions of the four-jet Avro Vulcan delta-wing bomber for the RAF, and the powerplant also is being considered for the delta General Dynamics all-weather fighter, now fitted with two Armstrong Siddeley Sapphire.

Weighing 3,600 lb., the new Olympus has a specific weight of 0.13 lb./hp, compared to the single-speed 16,000-lb. thrust Siddeley Sapphire's 0.25 lb./hp.

► **Fuel Consumption**—At the 11,000-lb. rating, the Olympus has a specific fuel consumption of 0.73. At 9,000 lb. thrust, fuel consumption is about 0.74. Olympus has low-pressure compressor stages and seven high-pressure stages. From just off the low-pressure compressor, the engine is all steel, from the front forward, midspan is aluminum-magnesium alloy.

At junction of turbine and engine there are two metal bellows providing a flexible joint to permit some movement of the long jet pipe installed in the Vulcan. The engine takes in one ton of air every 12.15 sec.

Hoskins points out that while the two-speed turbojet presently has a higher weight than a comparable power single-speed engine, it says it is in no position to produce a competitive engine.

► **Light Weight**—He believes the two-compressor engine of the future will be lighter in absolute terms than the single-compressor jet now being used. Using two compressors, maximum efficiency can be obtained in both low and high pressure stages, rather than having to compromise over the engine in the single-engine compressor. This means fewer stages for the same compressive efficiency, with the only net weight added being the additional compressor shaft required for the two-speed engine.

The Olympus has a 22.5-lb. pressure in the front part of the engine. Desired air to cool the compressor is not permitted to pass through the compressor and turbine, but is bypassed to the reverse compressor area and can turbine to cooling of the section.



technical bulletin

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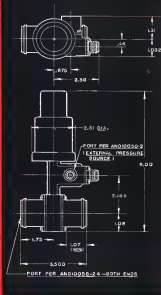
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News Sidelights

Convair TC-119C turbojet-powered version of B44 Chinook has been delivered to the 1708th Test Squadron (Turbo Prop), established last Sept. 14 at Kelly AFB, Tex. The squadron's mission is to test, under realistic conditions, the fleet of six turbojet-powered transports being modified by three manufacturers. These will comprise: Two Boeing TC-97Ts with P&W T73s and Curtiss prop, two Lockheed TC-119Ts with T74s and Hamilton Standard props and two TC-119Cs with Allison T55s and Allison props. The Allison T55-A11s now fitted to the TC-119Cs are rated at 3,216 shp, but the aircraft are designed to allow for installation of later T55s of about 4,000 shp.

New method of helicopter descent, utilizing a snap-out for picking survivors out of the water, has been tested by the British in the English Channel. The net is attached to a tubular D-shaped frame which is lowered from the cockpit, straight-edge downward into the water, where it is stabilized by a dragnet. In tests, more than 100 live pulgals were made, at times at the rate of 12 in 18 sec.

Official opening of \$15-million, 11th Verde International Airport, Forto Raco, now has been set for the first week in April by the Transportation Authority.

North American F-51 Mustang fighters, sold to Czechoslovakia government by U.S. to overcome aircraft surplus advantage in recent "exchange," were taken into combat by communist forces since Jan. 1945 following one day of ground operations. McGraw-Hill World News reports. None of the major pilots previously had fighter plane training or experience, yet quickly succeeded in level ground striking and bombing missions after brief indoctrination.

Hansen engineering design of the new Soviet MiG-17 has been completed. New York industrial design consultants working closely with MiG's equipment engineering group.



FOR DELIVERY of spare, large and large, twin-engine aircraft planes in this country operated North American A-1J Super, powered by two F&W B280 piston engines and an Allison JT1 turboprop. Here an A-1J gets set to be taken to the flight deck of the USS Midway by a deck-edge elevator. Wings and tail are folded to conserve space while it was launched. Superprop, principal Douglas A-1J Skyraider is slated to replace A-1J as Navy's language nuclear weapon booster.



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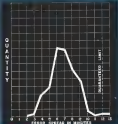
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LETTERS

on to look over the wheel well of a Corsair approximately 500 ft above us and headed in the opposite direction. Subsequent air intercept proved that the Corsair was without approach control at the airport; we had just left and was, of course, on different frequencies; its presence was unknown to the control tower at our destination airport and to us, and the Corsair had just broken contact in the course of a properly performed enroute approach. We missed one another by something less than 200 ft...and had we collided both our VFR operations and the Corsair's IFR operations would have been perfectly legal ones by the time that VFR non-existence proposal is raised in court. The above described situation was some knowledge to me and my passengers that it was in the Corsair's path and in our path for the simple reason that we had one head-on collision of the right order side while no one aboard the Corsair was even aware of our presence directly beneath them.

Consequently, we should like to propose a very simple remedy for our own complaints and those of any law-abiding citizen: independent and those of traffic controllers, mutual trust operations. CAA safety agents all being present everywhere.

1. A simple rule difference between VFR flight and IFR flight is going up the mountain of clouds on an overcast or control tower.
2. Because that all aircraft in these air spaces are flight plans, make position reports, and conduct their flights in accordance with previously issued traffic clearances.

If the above suggestions were carried out, the only difference between IFR and VFR would be the actual weather itself. The pilot assigned a normal pattern of approach for his flight was faced on an instrument wing or who had the proper instrument equipment to fly in a cloud or actual instrument would then be obliged to alter his flight plan or approach a landing if he found himself unable to proceed in accordance with the traffic clearance without going on actual instruments. This would avoid all sorts of the same treatment and the same problem scenario of miscommunication or regulation.

The basic principle upon which CAA has been written since its formation is that no individual has the right to ask us to do as we wish but we do not have the right to disrupt the life or property of others. This principle is still a law of the land and would appear that both of your correspondents agree with this object.

DAVID H. KERRILL
Pilot
Discontinued Flights Co
Detroit 18, Mich.

AIEE Shows Interest

The "Pilot Center" of the Jan. 18 issue claimed that the AIEE takes a dim view of aviation. As a member of both the AIEE and the AIAA, I think that a closer examination will show that this is not the case.

It is the prerogative of the AIEE to have



Olis Mathiasen's DC-3...A sub-zero Canadian night...in one engine—
New Koolmotor Aero Oil...in the other—another brand...

...and here's what happened!

The pilot was Ned Finken, the first Olis Mathiasen Charter Corporation, Baltimore, Maryland. Awardee; a DC-3 through Canada in sub-zero January weather.

Before leaving, Finken observed an interesting and profitable experiment. In one engine he placed the aviation oil that was standard for Olis Mathiasen's operation at that time. In the other, he put Olis Service New Koolmotor Aero Oil.

Then came the night he had to leave his DC-3 out on the bitter-cold ramp at Toronto Airport. Next morning, with the thermometer reading right below zero, Finken climbed into the plane to start the engines. Trouble? trouble you bet... trouble starting. But the first engine to

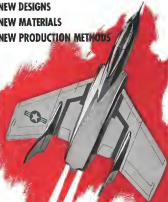
kick over was the engine using Olis Service New Koolmotor Aero Oil.

That was enough to tell Ned Finken on New Koolmotor Aero Oil...and he's not doing the over-ice! Summary up his experience, he says: "Olis Service New Koolmotor Aero Oil provides for more satisfactory results in any weather and has enabled a substantial reduction in oil consumption and general maintenance expense."

Results such as Ned Finken's are not the exception, but the rule, with New Koolmotor Aero Oil. This improved aviation oil can produce similar results for you. Why not try it? You'll find it wherever the familiar emblem of Olis Service Aviation Products is displayed.

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LETTERS . . .

introduced conference for on two speakers present. Another is one of these.

The Air Transportation Committee met during the Fall General Meeting in Chicago, Oct. 11-15, 1954. At this time there were eight minutes on aircraft subjects, with 34 papers, more than on any other subject.

The Aircraft Technical Committee of the Institute Section of the ASEE has quarterly meetings at which time papers of interest to aircraft electrical engineers are presented. The IRE has no such program.

It is not the abundance of papers presented at one general meeting that determines the relative activity of a professional organization in a specialized field; it is the organizations that has the largest number of papers presented to the most men. On this basis I feel that the ASEE exceeds the IRE in aviation activity.

W. W. Loomis II, Assoc. Member ASEE
Engineering Designer
Harvey Airplane Co.
Seattle

In 1954 the American Institute of Electrical Engineers scheduled Air Transportation sessions at two separate meetings. There were Air Transportation sessions at Los Angeles, at our Summer General Meeting in June, and also recently at our Fall General Meeting in Chicago in October. At the latter meeting we held eight half-day sessions with three to five papers presented at each.

Past experience has shown us that we cannot get a good attendance at the New York meeting because of the schedule of sessions held there. For this reason we held Air Transportation sessions at two meetings a year distributed and get better results.

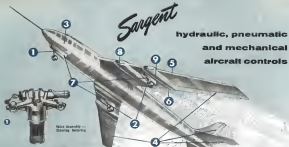
N. F. Scarce, Chairman
Aircraft Section ASEE
American Institute of Electrical Engineers
Lubbock, Texas

Similar letters of protest, denouncing the activities of the ASEE's Air Transportation Committee, were received from the following: Dennis E. Fritz, Cleveland, Ohio; Richard E. Wilbur, San Diego, Calif.; Joseph W. Allen, Birmingham, N. J.; Ernest F. Katsch, El Cerrito, Calif.

Recently when attending an air show on the aviation activities of the ASEE Committee on Air Transportation met at the ASEE at 1954. Associate Wagon's program relative has been an ASEE member in good standing of last year (I am sure longer than he has been a member of ASEE).

Despite the abundance of papers presented by the ASEE Air Transportation Committee at the Fall meeting in Chicago, the summer meeting in Los Angeles and the conference held the year before in Seattle, the members of East Coast airlines and aviation firms would seem to justify at least one technical aviation session out of the 90 sessions scheduled for the winter ASEE meeting in New York.

On contrast, the ASEE has held two annual conventions devoted exclusively to aviation in the past year at Dayton and Sullivan, Missouri, that did not present ASEE from scheduling more aviation sessions out of the 90 meetings to be held at its New York convention in March.



Valve Assembly — Flange, Flange



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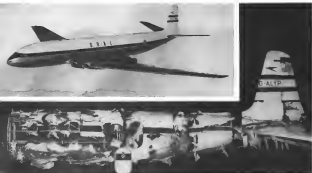


8



9

AERONAUTICAL ENGINEERING



COMET CORPSE is reconstruction of wreckage recovered after disaster in world's first jet transport air crash.

Scientific Detection Helps . . .

RAE Engineers Solve Comet Mystery

By David A. Anderson

The Royal Aircraft Establishment's analysis and deduction of the probable cause of the two Comet disasters stand as a high-water mark above the flood of investigations which followed the accidents.

Cited as "one of the most remarkable pieces of scientific detective work ever done," RAE's effort was the product of minute examination, painstaking analysis and deliberate deduction, held together through intricate hints by British security and national pride.

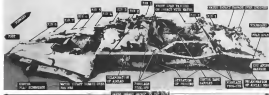
It took the better part of a year's work by hundreds of scientists, technicians and laborers. At one time or another, the wings BAE sent to Farnborough were working on the job.

"I drove my staff, and incidentally myself, well beyond normal limits," said Sir Arnold Hall, RAE's director.

"We had a very large deployment of industrial labor working 50 hr. weeks and we had a large number of men that we drew on 160 and 120-hr. weeks in order to get this rather forward."



TANK TEST was one phase of intensive investigation at RAE Farnborough. Complete Comet wreckage was submerged, protruding wings were loaded to simulate flight plus.



WING WEEKAGE gave first clue; part wing and center section kept showed cooling flow burst holes. Starboard wing is shown below.

RAE's part was finally secured in a research report, providing a flag at metal fatigue as the probable cause of the failure, and ruling out a host of other possibilities. The report—Acident Note 270, September 1954—became one of 145 exhibits placed in evidence during the 12-day hearing which concluded the investigation.

This is the story behind that report.

The Beginning: This was the status when BAE was called in.

Two de Havilland Comets on regularly scheduled service with British Overseas Airways Corp. had been destroyed and lost with all passengers under unusual and mysterious circumstances. Both were less than six hours out of Glasgow airport at Rome, both enroute to Athens. Both disappeared without a trace.

The first Comet-G-M-T-P was the prototype airplane and was lost on Jan.



FOR COMPARISON: Comet wing, bottom surface up, shows on assembly defects in design.

10, 1954, near Elba. An investigation followed, while attempts were being made to recover wreckage. The Coast Guard, grounded after the wrecked, was released again for operations Mar 23.

On Apr 8, a second Concord — G-ALTY—was lost near Naples. The fact was grounded again, and for Arnold was cited by the Minister of Supply to start an investigation.

Little to Go On—Had) was not optimistic about the chances of finding out much. The only wreckage then recovered was the remains of a few parts of the fuselage and engine system. The water was hopelessly deep off Naples, and the location of the wreck un-

known. Of Elba, things were little better. The plane was on the bottom about 600 ft. down, and next a horizon emerged, still unswayed and unmovable.

There had been previous Concord tests, too. Frigate tests of the wings had been made in 1931 and 1932 at Funching, and the Concord's wings—which showed some indication of early fatigue—had been modified and reinforced. ROAC had conducted a thorough investigation of its own after the Elba accident, under the direction of C. Abell, deputy operations director for the airline. RAE and ROAC had been collecting gust data in flight for two years, using counting accelerometers

mounted in a Concord on routine operations.

"When I was asked to take on this job," said Sir Arnold, "I thought that if I had said, 'No, it is beyond what one could reasonably be asked to do,' I would not have been blamed."

But Sir Arnold's scientific curiosity and his understanding of the great need for a solution ruled out any retreat. The job began.

Wings and Wreckage—There are two possible paths to an investigation of the kind. First, you look at the wreckage to discover what might have happened. Second, you look at an undamaged airplane, test it, analyze its reaction to see what could happen. In a sense, you go from the job to the wreckage and back again, in a continuous feedback loop.

At the start, there was little work going. By look, the Elba wreckage was sitting on a fairly level bottom, in company with a Douglas from the First World War, a Gotha wing or two, and some twisted metal.

Four British ships and shorted Italian trawlers slowly plied the water, trying to find the wreckage. The wreckage was under water, and the wreckage was under water. The wreckage was under water, and the wreckage was under water.

Salvage operations continued during bad weather, from late January well into August. Snow fell for the first time in 20 years near Elba. The water was nearly, landing the wreckage. The wreckage was under water, and the wreckage was under water. The wreckage was under water, and the wreckage was under water.

As the pieces came out of the sea, they were returned to England. The engines went to the Hawke, all the rest of the wreckage went to RAE Funching, assigned to Eric L. Ripley, head of the accident investigation section.

As the pieces came out of the sea, they were returned to England. The engines went to the Hawke, all the rest of the wreckage went to RAE Funching, assigned to Eric L. Ripley, head of the accident investigation section.

These are three phases in the study of wreckage.

Reconstruction the wreckage. This shows each part in relation to the whole assembly and shows discontinuities in design. By these clues, the investigator can say whether the plane was on the ground when it broke up or whether the damage was caused by the violent descent or by impact with the ground or water.

Determine the kinds of major failures. Metal failure, like corrosion,

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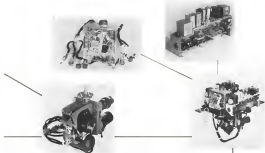
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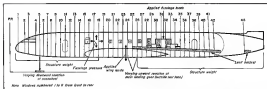
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FUSelage LAYOUT of DBI Comet shows application points for loads along water tank bulkheads to check integrity of pressure cells.

have characteristics as individualistic as fingerprints. Further analysis into the problem shows that this joint failed in tension, then in shear, then in tension, and then in fatigue.

• **Determine the sequence of the failures.** This is the core of the whole study, and depends on the recognition of the footprints of motion in one part across over another in heading up.

This was Raper's task, he said, and crew worked the broken bits into an acceptable shape, watching each piece

for the telltale of death.

• **Theoretically—**Dr. P. B. Walker, head of Fairbrough's Aircraft Structures department, had another approach. With our knowledge of the wreckage, and after the Nighthawk crash, he became suspicious of fatigue of the pressure cells.

There was one objection in Walker and during the inquiry. "I think it was quite conceivable at the state of knowledge then that fatigue of a pressure cell could occur after such a short time."

To test his theory, Walker proposed substituting a complete Comet fuselage. In April, the Avnair decided to build the tank and winged to get another BOMAC Comet-CALYU-to test to destruction.

CALYU was stripped down to all accessories that could be water-damaged. All non-structural fittings were removed for better inspection of the skin and structure. The vertical and horizontal ribs were taken off, and Yoke Uddle was whittled into its final



Flash butt-welding of mill-rolled sections will save \$186,888.00 this year for one jet engine manufacturer

By designing the mill-rolled section shown above, instead of using a rectangular bar, 98 lbs. of metal per ring was saved. The cost of fabricating rings was reduced \$77.87 per ring.

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2

FASTENER PROBLEM



Leakproof self-locking fasteners for integral fuel tanks

Aircraft designers have eyed the space-saving possibilities of "Wet Wing" or integral fuel tanks for some time. But — the "wet" nature of the wing must be fastened in such a way that highly volatile vapors held will not leak under the force of the tank fasteners or seep out along their bolt threads.

ESMA has just developed the first completely patented answer to this problem. The new ESMA type A2500 floating rubber cap nut (see diagram) is a self-locking rubber nut with an "O"-ring and an air base. In tests, the nut has maintained a perfect seal against pressures above 50 psi on either side, regardless of structural stress, vibration, or temperature changes. The seal is effective whether the bolt is installed or not. It is not destroyed by repeated leak installation.

The type A2500 is the lightest nut of its type, 100 1/4-28 size nuts weigh only 1.2 pounds. It meets AN-36.5 specifications for operation between -50° F and +250° F and can be used for stresses beyond these limits by varying its component materials such as the "O"-ring. It provides 334-psi maximum floating action allowing quick assembly in spite of slight misalignment of bolt holes. The A2500 is a 3000's and retails price to shipment. The basic design has been approved by the USAF. Size range from 10-36 through sizes 1-4-28, 3-16-34, 3-5-34, and 7-16-36. A gage showed rapid production of a series of regularly spaced A2500 nuts has also been designed.



The new ESMA type A2500 is among the first aircraft equipped with integral wing fuel tanks tested with the new ESMA type A2500 fastener nut.

MAIL THE COUPON FOR DESIGN INFORMATION

Write: Shop Dept. Commercial of America
Dept. 101-525, 12120 Broadway Road, Belton, New Jersey

Please send me the following free literature:

- ☐ Details on A2500 nut
☐ ESMA's "Wet Wing" nut details

☐ Details on A2500 nut installed in gage design setup.

Name _____ Title _____

Firm _____

Street _____

City _____ State _____



at altitude, and broken up in the same way. They took two and a half minutes to come to earth, checking roughly the estimates of fall time made from examination of wreckage. Wreckage backlogs with the loss of domestic similarity, engines detached the Comets were at about 15,000 ft., as just at the top of their climb, when the accidents occurred.

►Fuel and Overloading—There was some feeling that a fuel explosion in the lavatory tank had caused the accidents. They were thoroughly checked and rejected, as was the theory that the wings had been damaged to the point of leakage by overloading with the pressure-equalizing system developed for the Comet.

Scotsman suggested that the time had exploded, with an effect like a bomb at the wing slot. This was thrown out after seeing the wreckage. Those who had read detective thrillers saw the danger of a bomb in one of the bombards. There was no indication as either the wreckage or on the bodies that an explosion of any kind had taken place.

Letters poured in. Perhaps the Radar receiver had failed under the pressure. No, said the RAE engineers, because the wreckage showed that any Radar failure occurred on impact with the water after the accident. Perhaps there had been sabotage. No, said the investigators, no evidence.

Letters suggested collisions with a meteorite and even deliberate destruction by Hitler in a final snare. Briefly, the committee reported there was no evidence in the wreckage, unless of course, they remembered was considerably different from the conventional.

►The Frame of the Problem—This was the way the investigation went. Any

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The flight of the Vickers-built airliner is characterized by a remarkable lack of vibration and a very low

noise level, thus increasing both passenger and crew comfort. Cruising speed 320 m.p.h. with four Rolls-Royce "Dart", two stage and flow turbines each developing 1,400 h.p.

In exceptional economy and ease of operation, together with its established popularity amongst air travelers makes it a notable "double-first" in airline operation on this continent.



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Type T1.5 Baroresistor Minimum voltage: 75 volts
Range: 0-14.7 psi absolute Resistance: 100 ohms
Stable: No characteristic drift; big shock

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Serve — Very easy to use; give as a function of altitude
Fly Control — An accurate measurement of altitude — Pressure transmitter
Computers — Voltage divider, P and T ratios. Recording — Pressure transmitter

MEMO TO ENGINEERS You can specify Trans-Sonics Baroresistor with confidence because:

1. The instrument is immune to dust, fumes, moisture, oil vapors, etc. The baroresistor and moving parts are hermetically sealed in the reference vacuum with the measured pressure obtained into the bellows only.

2. Every instrument is subjected to a detailed performance inspection. Shown in the photo is a special calibrator which automatically records the increasing and decreasing resistance ratio versus pressure plot of the instrument's performance. In addition, this calibrator provides an inspection of each turn of the potentiometer wiper.

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system, regardless of how ridiculous it seemed at first glance, was explained. When a theory needed proof, tests were made. Expense was not considered.

As the days dragged into weeks and months, there was little positive evidence to support any hypothesis. Then, there was enough to rule out many of the alternatives, but not enough to put the finger on any one.

The break finally came in June, when Ringley and Hall were looking at the wreckage together. The most part wing was covered on the upper surface with sparrows lines extending almost to the ailerons. Something had impacted on the wing and been forced or dropped out sideways. It must have been moved by a considerable force to stay on the wing for such a great distance in the high-speed slipstream over the wing.

Ringley and Hall agreed that either a piece of the cabin had been projected along the wing, or explosive action, or by an unknown state of war.

On June 21, a piece of the port outer structure was recovered. Its jagged edge matched the scar on the wing. It had been the piece that blew out along the spine, leaving its trail to be found months later.

Three days later, the first failure occurred in the tank when the fuselage blew out at a large section. In a few more days, Hall and his staff were certain that the first fracture on the Tibo Comet must have taken place on the top of the fuselage.

The telemetry was used to transmit these words for wreckage. Toward the end of August, the sea bottom gave up the last link in the chain—the upper fuselage section near the ADF "seal-off," discovered by foreign fishermen. The final goal was in sight.

(This is the first of a two-part article dealing with the Comet investigation. The second installment will appear in the next feature.)

THRUST & DRAG

Several people have asked where they can get copies of Hans Meißner's book, "Fast and Fast (I) Flow for the Factor Between Things in the Air." Copies could have been obtained while they lasted from the publisher.

Hans Meißner is a German-born physicist, G. M. S. H. H.

Untermyerstraße 10, 1000 Berlin, Germany

Unfortunately, the entire original printing of eight copies was sold out (to Meißner's relatives) and the publishers do not plan any further printings—DAA.

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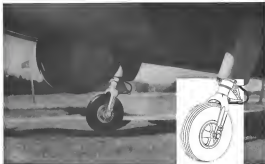
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Whether on soft or rough ground, and in gales, the Seamew can alight in an extremely small area because of its low landing speed and long take-off run. Type ships can be easily changed to suit localities.



Thermocouple grid landing characteristics of the Seamew combined with simplicity of construction and slow speeds make it an excellent type ship for jobs with little expense of this type.

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Recovery of manholes is provided by means of man hoists and glass components



IN QUANTITY PRODUCTION FOR THE ROYAL NAVY

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WHAT'S NEW

Telling the Market

Timbering tables for download and online applications provided in Bulletin 45 published by Saperco Tube Co., Norristown, Pa. . . . Wet shaver persons cleaning and finishing are dealt with in 18-page Bulletin 141-D, available from American Wheelabrator & Equipment Corp., 1001 S. Bay St., Milwaukee, Wis.

Standard position index tables for fast production are described in Crating 369. In various assembly drawings, load ratings and dimensions of over 100 models. Obtainable from Ferguson Machine & Tool Co., Roller Gear Division, P.O. Box 141, St. Louis 21. Complete line of seal and hydraulic cylinders, valves and packaged fluid power devices is covered in 120-page data book from Modulator Corp., 490 First St., San Leandro, Calif.

Production Digest is 60-page handbook of current shaver grinding and polishing techniques assembled from 30 technical papers prepared by technical engineers of Bore Blasting Inc., Pennsylvania. Write the firm at 1309 N. Y.

Installations of Tim-Lok cases in industry are pictured in Bulletin C-51 to provide hints on how cases may apply equipment in their plants. Also covered: case section breakers. Available from: Harsco-Engel Corp., 4611 W. National Ave., Milwaukee 45.

Tools for aviation and industry are described and outstanding individuals devoted to new catalogues distributed by Instrumental Steel Co., Marketing Services Division, Englewood, Ind.

Laboratory and production testing methods for testing, handling and acceptance, including "revolutionary" combination mill that can be converted from two to four high for greater processing versatility, are shown in 200-page 125 available from Steel Mills Marketing Co., 47-25 37th St., Long Island City 3, N. Y.

Publications Received

- The Observer's Book of Aircraft, by Bill Gunston and Gerald Phillips, illustrated by Peter Moncrieff. Published by Frederick Warne & Co., Ltd., London and New York, 1955. 317 pp., 100 illustrations \$1.25. Cloth-bound pocket manual containing all available details of 116 military and civil aircraft.
- The Gyroscope Applied, by E. J. T. Rich, editor, Philadelphia Library Inc., New York, 1914. (Buy \$17.50.) Series cover gyroscope fundamentals and marine, astronomical, military, and other applications. A mathematical approach deals with the elements of gyroscopes.

Flexonics Ducting Components absorb thermal expansion at 1400° F. in the Douglas C-124 heating system



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FLEXION DUCTING is available in steel, cast iron and bronze and types in a complete range of sizes with or without insulation. It has flange and end connections open or close to be applied.

FLEXION METAL HOIST is manufactured in the broadest variety of sizes and types for all aircraft applications.

FLEXION BELLOWS are made in an almost unlimited range of sizes and types to meet the most advanced requirements.

Thermal expansion, at 1400° F., occurs passed by viscosity means caused a design problem in the exhaust line at the main cabin heater of the Douglas C-124. A consultation was necessary that would absorb expansion and vibration at very high temperatures and real exhaust gases at 540 psi. The problem was solved with a 6" I.D. FLEXION Hot Flow Type HF-40 assembly designed for 415° F. expansion and equipped with a stainless steel liner. Rice-Rice Type HF-40 is an assembly consisting of stainless steel flexible sections particularly suitable for high-temperature expansion control.

Whether consultation may be made to absorb expansion and vibration, specify FLEXONICS Ducting Components. There is a size and type for every need. For specific needs, consultation, just send an outline of your requirements.

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Manufacturers of flexible metal hose and conduit, expansion joints, bellows, valves and accessories of these components. In Canada: Canadian Corporation of Canada, Ltd., Montreal, Quebec.

PRODUCTION



F-100 WING STRUCTURE reveals large integral ribs, leading edge spar with plow flange, and staggered intrados ribs.

Production of USAF Fighter Ace Hums



INSIDE FUSELAGE, looking aft toward cockpit, where man crouches.



TAIL SECTION gets flanking teacher before looking.



AFTERBURNER-FITTED J57 JET extends from fuselage as it is lowered over wing of the Super Sabre to make engine job.

In volume production on the replacement for the North American F-86, the company's F-100, fastest USAF operational fighter, assembly has been placed in squadron service.

Superior in level flight, the F-100 was in production when the prototype first flew. Actual operations have not been commenced but it is known that large numbers will be built.

Photos here show various features in the fighter's makeup. Finelage has distinguished flat bottom, is fitted with Pratt & Whitney 38,000-lb. thrust J57 jet engine plus afterburner.



ALMOST COMPLETED, F-100 shows its sleek profile as it is prepared for cockpit.



ROLLOUT AREA is spotted with the fighter getting final adjustments. Plane in left foreground has fuselage right at cockpit.

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These include the attached online version

VALCOR ENGINEERING CORP.
CHICAGO, ILL. 60606-0001

PRODUCTION BRIEFING

• **Ryan Aeronautical Co.**, San Diego, Calif., has successfully tested its new \$175,000 jet engine test cell. Acoustic vibrations caused some minor engine operation difficulties, but the exhaust silencer chamber proved particularly effective, with sound concentrations possible immediately outside the test cell.

►Boeing Aircraft Co., Seattle, Wash., has included Tucson, Ariz., as a prospective site for new aircraft modernization facilities.

• **Leak Aviation, Inc.**, Binghamton, N. Y., has purchased two buildings comprising 35,000 sq. ft. in this city and will occupy the property by Mar. 1. Leak's current operating area totals 270,000 sq. ft.

• Atomic Energy for Industry, Inc., is a new firm formed by Dr. Charles H. Loh, specialist in aircraft and guided missile development, to concentrate on industrial and commercial applications of radiography, tracers, thickness gaging and quality control using radioactive chemical elements such as cobalt. The new firm will be located in Cleveland, Ohio.

►Gordian R. Hamilton & Co., master repave and modification firm, is completing a 10,000-sq. ft. plant at Tucson (Ariz.) Municipal Airport.

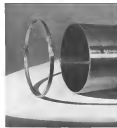
►Sunkhans Machine Tool Co., Rockford, Ill., plans to erect a new plant of about 175,000-sq.-ft. floor space on the outskirts of Denver to help increase output of aircraft constant-speed transmission. Plant is expected to employ 600.

► Steward-Bush, Inc., Gardena, Calif., has received a \$200,000 contract to upgrade 1,425-sq. Wright K1120-COHD engines for installation on Lear Learstar business and executive plane on

• **Scott Abrasive Manufacturing Co.**, Minneapolis, has acquired controlling interest in **Gry & Halgerson, Inc.**, Los Angeles, which does research and development on devices for aircraft and the related forces, such as actuators, electric motors, blowers, test instruments, transistors, assembled components, valves and control systems.

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RADIOGRAPHY reveals...



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equipment surveyed, is the only one which has no ventilation provisions, Tail unit. As a result, surface body temperatures measured in this aircraft were above the average for those in other equipment.

The selective, or selective-type component failure which Vito has investigated in the past have been found to involve poor design practices, such as eroded rivets or high body temperatures. The latter may be due to poor actual ventilation which fails to cool the critical component, or due to its use in too high a position of its total power or voltage.

• **Cutting Failure Rates**—The major role which the selective-type component failures play in reducing equipment failure rates is illustrated by two examples.

• **One transmitter model** reflected a very high rate of 2.58 failures per 1,000 operating hours, primarily because of consistently high failure of 2C10 tubes. If this one source is isolated, the figure for the same transmitter would show a failure rate of only 1.02 failures per 1,000 hours, making it comparable in reliability to another transmitter with only half as many components.

• A redesigned version of a radio receiver reflected only one-third as many failures as the original model. If malfunctions caused by the original model by selective-type failures of component sections are excluded, the two have nearly equal failure rates.

• **Prevalence of Rating Importance**—Vito's studies confirm on a quantitative basis what most electronic designers have long suspected on an intuitive basis: that the life of components is a direct function of their actual operating voltage or dissipation relative to their rated values.

For example, analysis of limited data indicates that 0.5-watt carbon resistors suffer the following failure rates during a 1,000-hour operating period:

- 0.06% at 0 — 25% rated dissipation
- 0.21% at 25 — 50% rated dissipation
- 0.12% at 51 — 75% rated dissipation
- 1.50% at 76 — 95% rated dissipation

These figures include selective-type failures and secondary failures caused by the malfunction of another component.

An analysis of capacitor failures shows similar trends (see chart).

• **Progress Continuing**—Continued work on Vito since the paper by Till and Shure was written has provided additional data which confirms the earlier conclusions. Till has told *Aircraft Weekly*. The analysis of component failures is a function of their application and operating point relative to

rated value has been expanded to include data from seven different types of equipment, most of the data which Till reported on in the types cited.

Till is optimistic that the Vito studies will provide the first quantitative relationship between equipment design and failure rate. The company

expects to complete its Redesign program this summer and make public its results at that time.

Although widespread acceptance generally is less vigorous than that found in high-speed aircraft and missiles, the data should nevertheless prove extremely useful to designers of airborne systems.

Resistor Failure Rates

(0.5-watt carbon composition resistors)

EQUIPMENT MODEL	PERCENT OF RATED VOLTAGE APPLIED	RESISTANCE SAMPLE	NUMBER OF FAILURES	LOSS RATE FAILURE RATE (PERCENT)
Tail B	0 to 25	40,000	1	0.00
	26 to 50	4,000	2	0.05
	51 to 75	4,000	1	0.02
	76 to 95	7	—	—
Radio A	0 to 25	10,000	1	0.01
	26 to 50	1,000	1	0.10
	51 to 75	1,000	1	0.10
	76 to 95	1	—	—
Radio B	0 to 25	10,000	1	0.01
	26 to 50	1,000	1	0.10
	51 to 75	1,000	1	0.10
	76 to 95	1	—	—
Total for the three models	0 to 25	50,000	2	0.00
	26 to 50	5,000	3	0.06
	51 to 75	5,000	2	0.04
	76 to 95	8	—	—

Capacitor Failure Rates

CAPACITOR TYPE	EQUIPMENT MODEL	PERCENT OF RATED VOLTAGE APPLIED	CAPACITANCE SAMPLE	NUMBER OF FAILURES	LOSS RATE FAILURE RATE (PERCENT)
AFTER	Radio A	0 to 25	1,000	0	0.00
		26 to 50	1,000	0	0.00
		51 to 75	1,000	1	0.10
		76 to 95	1,000	0	0.00
	Radio B	0 to 25	1,000	0	0.00
		26 to 50	1,000	0	0.00
		51 to 75	1,000	0	0.00
		76 to 95	0	—	—
	Radio C	0 to 25	1,000	0	0.00
		26 to 50	0	0	0.00
		51 to 75	1,000	1	0.10
		76 to 95	0	0	0.00
Totals for the 3 radio models	0 to 25	12,000	10	0.08	
	26 to 50	12,000	1	0.008	
	51 to 75	12,000	2	0.017	
	76 to 95	12,000	1	0.008	

CAPACITOR TYPE	Tail B	0 to 25	1,000	0	0.00
Radio A	0 to 25	1,000	0	0.00	0.00
Radio B	0 to 25	1,000	0	0.00	0.00

AP SOURCE: Vito Inc. Study

VITO CORP. DATA, obtained from analysis of Navy failure reports, provides quantitative evidence that component life depends upon its operating application.



National Seamless Tubes "back-up the blast" of Navy Jet's guns



NATIONAL USS Stainless Seamless Tubes are being used as gas blast tubing on the F2H-2, a McDonnell jet interceptor. The actual gas opening shown on the photograph are custom. But directly behind them, mounted over the machine gun's muzzle, are the gas blast tubes.

The job of the blast tube is to restrain high pressure caused by the firing of the gun, and to prevent the backflow of muzzle gas into the plane shell. These guns are highly explosive, and must be kept from the inside of the plane.

Previously, the 1½" OD x 1½" ID gun blast tubes were machined from bar stock. National Seamless Tubing, however, placed from solid billets of USS Stainless Steel offers the absolute uniformity of wall strength required for such a heavy-duty application.

Shelby Seamless Tubing, made by National Tube, is ideal for all types of aircraft applications—landing gear, engine mounts, wing spars, fuselage, fueling spurs, tail assemblies, etc. Shock-absorbent Shelby Seamless combines to the highest degree the desirable qualities of strength, safety and workability. It is uniform throughout and dimensionally accurate, possesses excellent machining and superior welding properties. Available in a wide range of diameters, wall thicknesses, various shapes and steel analysis, Shelby Seamless is preferred to existing materials by the world's largest manufacturer of tubular steel products: those your job presents to our engineers. They are here to help you.

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SHELBY SEAMLESS Aircraft Tubing



UNITED STATES STEEL



Side view of bomber shows thick lines. It is first production aircraft to have an electrical system incorporate a electric system.

Latest Air Force bomber has new G-E engineered power-generating electric system

NEW GENERAL ELECTRIC ENGINEERED SYSTEM MEETS DOUGLAS B-66 OPERATIONAL DEMANDS FOR HIGHER AMBIENT TEMPERATURES

A new G-E electric power generating system has been developed by General Electric and is now operating on the Air Force's newest light bomber, the Douglas B-66. The system consists of three major components: high-efficiency alternators, static voltage regulator, and generator control and protective devices.

DESIGNED FOR HIGH PERFORMANCE AIRCRAFT

With a generator that can operate at high static temperatures of high speed flight, the new G-E system is designed for long life and reduced maintenance time. Its static voltage regulator has no moving components to wear out, and after laboratory testing it has sustained 3600 hours of operation without maintenance.

Regulation is precise, and requires no pilot adjustment of voltage or load division. The control panel supplies the automatic control of start up, shut down, and emergency.

protection against ground fault, over and under excitation, and open phase.

SPRINGS TAKE-OFF, SPARES PILOT

The new equipment begins operating as soon as the pilot starts the engine. The system contains only two toggle switches, which may remain "off" all of flight, even when a fault develops. This eliminates a series of pilot functions and sharply reduces the time required to become airborne. Under normal conditions, fault clearing and resetting are fully automatic.

SINGLE SOURCE FOR COMPLETE SYSTEMS

General Electric offers a single source for complete G-E or the power generating systems and constant speed drives for most aircraft. For more information, contact your nearest G-E division, Springfield, or write: General 229-02, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

Static regulator (left) contains constant alternator output voltage. Control and protective panel (right) helps locate and correct faulty generator.

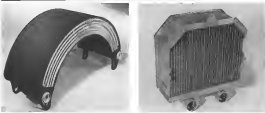
New G-E high-efficiency new generator has an efficiency over 1%, produces full output when exposed to high temperatures in high speed aircraft.

Tests of system showed better protection against over voltage, over and under excitation, ground fault, and high line, difference current, and open phase.

Douglas B-66 takes off at Long Beach, California, for its test run. The electrical system was designed by dual application engineers to deliver rated load with 10° C cooling air.

GENERAL  ELECTRIC





AIR-TO-OIL HEAT EXCHANGER developed by UAP for cooling Sandstead Dura Inerting oil on the B-7.

TAPPING-OFF HEAT EXCHANGER implements engine oil cooling. It sees run as an add-on. Weight is 44 lb.

New Units Solve Tough Cooling Problems

By George E. Gross III

Dayton—United Aircraft Products' developments are going into a growing list of new jet engines and military aircraft.

UAP-designed and built Hi-D (high-density) cooling and other equipment for engines, air used on Pratt & Whitney's J75, General Electric's J73 and J79, and Allison's J71. UAP units are going into such first-line production jets as the McDonnell F-105 Voodoo, the Convair F-106 Tigon, the Boeing B-52 Stratofortress. In addition, installations are called for on the Convair B-44 Hustler, the Republic F-105, the Chance Vought F-106.

Because of the success of their light and small Hi-D units UAP's techs can, under chief engineer Frank Casati, set new heat dissipating applications for use in the world field.

►**Expanding Applications**—Edward E. Ladd, the company's executive vice president, says the relatively small-size, lightweight Hi-D cooling equipment conserves the size and weight of a standard heat exchanger five to six times, with no sacrifice in efficiency.

Hi-D heat exchangers have now been revised to the responsive cooling principle to produce a still more efficient and compact heat exchange package, one of which is expanding into several new fields.

Among United's applications of Hi-D, plane engine-cooling jet units, expandable fluid heat exchangers for aviation guidance systems for guided missiles.

also, "tapping off" heat exchangers to supplement engine oil coolers, and emergency control for strategic submarines critical to boost the latter's output.

►**Responsive Cooling**—The point is in favor of responsive cooling is that water, cheap and available almost anywhere, is a very effective heat sink fluid. UAP officials say you can dissipate over 1,000 Btu's per ft of water heated all.

On wheels, ordinary tap water can be used because short duration of flight cancels out effects of deposits in the responsive cooling system. For sustained flights on piloted aircraft, where the system will see continuous use, distilled water could be used. The major problems of weight and space, plus necessity of keeping the water from freezing, will have to be faced, though.

United is looking into the desirability of other liquids, including ammonia, ammonia and water, alcohol, oil cooled water, and the reason because.

Water is good, but not all purpose. Where low temperatures are required or low standards other fluids are better. Where low temperatures are required in power, other fluids are required.

►**Teles Systems**—Another new development here is UAP's entry into the field of complete temperature control systems, previously the company had produced only individual components to be incorporated with other units and controls into complete systems.

One example UAP produced is a system to control directly-controlled cold as high as $\pm 30^\circ$ -temperature of aviation

equipment, components or other heat-producing airborne devices which need precise heat control.

Among aircraft incorporating UAP-developed systems are the Boeing B-57, Fairchild C-119B, Grumman SA-16 and the Panavia H-22 helicopter.

►**Hi-D Definition**—United officials do not reveal details of the Hi-D principle. Here is what they do say:

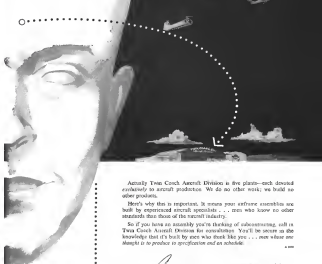
"A more efficient geometry of heat exchange surfaces gives a higher coefficient of heat transfer in a Hi-D unit while a higher density core provides more heat exchange area for a given volume of unit."

Hi-D heat exchangers were initially developed to liquid-to-liquid oil cooling for jet engines (using fuel flowing to the combustion chamber to cool engine oil). Purpose was to kill a base and support fuel pump engine need—higher oil cooling temperatures for major jet temperatures (not with increasing thrust) without going to uneconomically large exchangers and high weights.

►**Seven Weight & Space**—Hi-D cooling accomplishes this job successfully. For example, on a typical jet engine installation, a Hi-D unit with a dry weight of 4 lb. and a wet weight of 6 lb. replaces a standard unit weighing 18 lb. dry and 27 lb. wet. A suitable space saving of approximately 300 cu. in. is achieved by replacing a 720-cu. in. envelope with a 115-cu. in. envelope. Both heat exchangers are of the same quality.

Weight saving of the Hi-D units is so great that standard dual units can be

plant with a
one-track mind...



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The extensive capital expenditures required to meet competitive pressures have put many manufacturers in an unfortunate position. Modernization is necessary if the manufacturer is to price his product competitively and still make a fair profit. However, the first profit is necessary before he can afford the modernization. Two new Verson plans make it possible to modernize now and pay for it out of the increased profits it provides. If you run one of the manufacturers hard with the dilemma of needing modernization for better profits, but needing better profits before you can afford modernization, one of these plans may be the answer to your problem.

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HYDRAULIC FLATS suit on McDowell P-101 Verson with two individual hydraulic stands. Engines had in mind in the instant.

plant elements cooler and still be lighter

►Cooker Applications—This list of engines and stands which cannot fit D-cooler shows the most acceptance:

• Engines: J35 (Alcoa), J47 (GE, Packard, Stoddard), J57 (F&W, Ford), J65 (Wright, Buick), J67 (Wright), J71 (Alcoa), J73 (GE), J75 (F&W), J79 (GE).

• Aircraft: Cessna B-36 and B-53, Maule B-97, Beech B-47, North American P-51 and J-1, Cessna Vought P-51, Lockheed P-104, McDowell P-101, Republic F-105, Douglas A-1D and B-66, Bell B-47 helicopter.

►Muffle Cookers—United's muffle heat exchangers are expendable M-D-plus-expensive-cooking systems. They will be essentially free of maintenance effects (aged, obsolete, temporary).

The packages are being designed with emphasis on simplicity, trouble-free service through use of few moving parts, and convenient use of ball-and-rod. Yet they will give extremely an exact temperature control. United has vehicle systems in various stages, all the way from initial design and layout to prototype and pilot production.

These engines have more than just strength and muffle application—also use as in trailers, skid and ship board installation.

►Topping-Off Cooker—Just right at its lowest high altitudes has brought with



DRAIN CHECK VALVE stops water-absorbed leak through actuator at engine failures. It also acts as a pressure relief valve.



U.S. OPERATOR in muffle order room in the shop with double-blind working only from hand side to see out front side. End — in 10 seconds.

SCARF'S CORNER AIRMAIL will be a faster way to make. See the Post Aircraft Room from side view.

Speeding blind fastening for electronic eyes

ANOTHER ASSEMBLY PROBLEM SOLVED WITH DU PONT RIVETS

FIRM: The I-T-E Circuit Breaker Co. of Philadelphia, engaged in manufacturing radar systems.

PROBLEM: Assembling the scanner, with its dozens of blind applications, hand-to-get-it and tight-torque jobs. This could be a painstaking, long-drawn-out operation.

SOLUTION: I-T-E chose Du Pont Aircraft Rivets to do the job, and these split-second fasteners have cut assembly time to a minimum. Operators are setting as many as 20 a minute, with no other counting to slow the work. They simply insert them, expand them with heated tungsten—500° F. or so—and a snap-ratchet, one-dial operation, 50% faster than conventional methods. . . the way to speed "problem" jobs.

Designed for both primary and secondary structural applications, Du Pont Aircraft Rivets can save you fastening time and money. Write for free 28-page booklet to: The Du Pont Company, Explosives Dept., Wilmington 98, Delaware.

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- EXPLOSIVE RIVET** is forced to desired hole. Gun, driven down, sets it in place, expanding inside to form design.
- TOP** of rivet is forced by gun. Rivet is expanded to set back, long design. Rivet is placed in hole, then gun is moved to place.

DU PONT AIRCRAFT RIVETS

A Product of Du Pont Research



BETTER THINGS FOR BETTER LIVING
— THE DU PONT COMPANY —



WLD UNIT FOR G-22 JTF—Water/lift-off heat exchanger (left) and water-lift-off cooler (right). Maximum heat dissipation is 650 and 2,330 Btu/min, respectively.

cooling problems which a liquid-to-liquid cooler appears to be able to solve.

To supplement the performance of liquid-to-liquid heat exchangers at high altitudes (around 50,000 ft.), use is made of auto-oil heat exchangers in series with liquid-to-liquid units.

The reason for the inability of the liquid-to-liquid heat exchanger to cool the engine without aid under the new conditions is that fuel consumption decreases at altitude while heat rejection remains constant. Fuel is no longer available in sufficient quantities at altitude to use as a "heat sink."

The problem is further complicated when extremely high flight speed is coupled with high altitude, since that combination makes even more important a heat sink (extremely low density coupled with rising temperature).

The solution of this problem seems to be use of an expendable heat sink carried in the plane. Water is extremely attractive for this application—it not only has a high latent heat of evaporation, but at altitude it will boil at a relatively low temperature.

UAP engineers believe that in at least two cooling applications (engine oil and crew quarters) their topping-off heat exchangers, using the H-D-plus-expendable-cooling combination, will provide at least a temporary solution.

In UAP's engine oil system, the topping-off cooler is connected in series with the regular liquid-to-liquid cooler, boosting the latter's cooling capacity sufficiently to raise the combined heat rejection of both coolers adequate to take care of current engine oil cooling requirements.

Auto-oil topping-off coolers use low standard equipment on most low-speed high-thrust turbojets, according to UAP. Addition of vapor-type heat exchangers should extend the engine's oil cooling service's maximum operating altitude down about 50,000 ft. to somewhere above 70,000 ft. and permit an increase in Mach number, say UAP officials.

For crew quarter cooling, the topping-off heat exchanger is installed between the passenger, or crew intercooler and the engine's heat sink. This increases appreciably the cooling capacity of the aircraft's cooling system without added weight or space penalty.

UAP builds two types of heat exchangers—tubular or plate-type. Either may be used in liquid-to-liquid or air-to-liquid applications and either may serve as a cooler or a heater. The tubular type is supplied in either aluminum or stainless steel.

For Electronics Team-Airborne crew development among UAP's H-D cooling devices is a pair of electronic cooling packages designed specifically for rack heat-producing electronic components as in this illustration.

United relies on electronic cooling units "to make the aircraft possible means for dampening of heat generated by modern electronic equipment."

UAP's H-DH system consists of a compact package which is installed in a compartment where it depends on air or supply which must not exceed 100°F at sea level or 65°F at altitude.

UAP's H-DH system is basically the same, but has the added advantage of flexibility since the heat exchanger envelope is designed to be modified remotely from the package controls in such places as a crew air duct or a cooled air duct leading from refrigeration units (photo below left).

These two units can withstand air temperatures from -60°F to +100°F in the respective state. And certainly has been designed into the package which prevent excessive pressure from capturing any portion of the unit which might damage the electronic equipment they are cooling.

To meet out its electronic cooling packages, UAP has also developed units which incorporate both water-lift-off and hydrazine-cooled convection systems.

Other Products—UAP produces many lines of aircraft equipment other than heat exchangers. Among these:

• **"Self-energized" metallic O-rings.** Designed for use in static installations, these O-rings are made of metal fabric with the ends interlocked together. The self-energizing feature consists of drilled hole holes in the ID of the ring. Three act as ports, allowing sealed pressure to penetrate into the O-ring. This balancing pressure on the inner

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future, the man with the Air Force career is eligible to serve with a life income.

As a designer and builder of modern aircraft, Douglas is in a position to judge the skills developed by Air Force training. They couldn't be higher.



Student members of the U.S. Air Force study a Douglas X-100.

Depend on **DOUGLAS**



First in Aviation



WLD UNIT (above) is installed readily in this setup for cooling engine equipment.

AWARD-WINNING POWER BEHIND



NORTH AMERICAN'S F-100 (top) and DOUGLAS' F4D share honors in the award of the Collier Trophy in 1964. Both are superiors. The USAF F-100 Super Sabre holds the official world's speed record of 155.148 m.p.h., set in 1953, only a few weeks after the Navy F4D Skyray had set 152-943 m.p.h. to bring the speed record back to the United States.



OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
UNITED STATES DEPARTMENT OF DEFENSE

THE COLLIER TROPHY FIGHTERS

Pratt & Whitney Aircraft's J-57 engine gives supersonic speed to the F-100 and the F4D

With the 39th Collier Trophy award, America salutes two top jet fighters and the men most responsible for their design. The North American F-100 Super Sabre and the Douglas F4D Skyray are major achievements in aviation—and in U. S. Air Power.

Both Super Sabres and Skyrays are rolling from production lines to take their places in the nation's defense. And both are powered by America's highest-powered turbojet in quantity production—Pratt & Whitney Aircraft's J-57, winner of the previous Collier Trophy.

The Super Sabre and the Skyray are of a new generation of air power: a fighter generation designed from the beginning to utilize the tremendous thrust of today's high-powered engines. They are designed to fly and fight and climb supersonically . . . as their missions demand.

Pratt & Whitney Aircraft's J-57 is continuing to make its vital contributions to American air strength.



THE MIGHTY J-57—More than 16,000 pounds of thrust is provided by Pratt & Whitney Aircraft's J-57. Afterburners increase the basic thrust tremendously for short periods of operation. The engine offers outstanding fuel economy and high acceleration, vital to further operations. In addition to the huge thrust needed for supersonic speed, a year ago Pratt & Whitney Aircraft's J-57 was the heart for the Collier Trophy award.

Pratt & Whitney Aircraft

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Jet engine of North American F-100

vacuum-melted metals for "hotter" engines...

Vacuum melted metals are leading the "thermal-metals revolution" of jet engine design. For they make possible higher engine operating temperatures, under conditions where conventional alloys fail rapidly.

Turbine blades of vacuum-melted superalloy, for example, were tested together with comparable blades of air-melted alloy. After 40 hours of operation the air-melted blades broke when bent less than 90°... the vacuum-melted blades took a full 180° bend without failure! For many such test findings, too, vacuum-melted metals far outperform conventional alloys.

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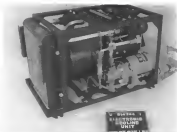
surface of the ring prevents it from collapsing.

The satellite units can withstand very high temperatures, such as jet engine fuel at up to 1,200°F, lubricating oil at up to 600°F, hydraulic fluid up to 500°F, and combustion gases up to 1,800°F. They are also good to -250°F.

OAF sees the rings are extremely resistant to corrosive liquids and gases such as jet engine exhausts and sea salt. Furthermore, "the self-energizing satellite O-ring is capable of sealing fluid pressures equal to the ultimate compression stress of the metal shaft, i.e., pressures of 16,000 to 168,000 psi, or more. However, in a specific application, the pressure limitation is a result of excessive deflection of the sides of the O-ring grooves."

OAF has recently formed a wholly owned subsidiary, United Mould O-Ring Corp., to handle all manufacturing, engineering and development of the rings.

• **Dealing with cold weather of cockpit.** With this system (Aircraft News, Sept. 24, 1955, p. 35) aircraft, left standing in temperatures as low as -65°F, can be started in a matter of minutes instead of hours, with no pre-heating whatsoever. Components part of the Hot Fuel Preheat System, which eliminates long fuel preheat periods. United also makes a large line of



THE COOLER for engine equipment mounts the 28-20 and 28-10 lamps.

thermostatic power elements (such as Vespacore thermostats and thermostat relief valves), lightweight heat exchangers that provide great flexibility of installation, oil separators and transmitters, signaling valves, waste valves, waste checked down check valves, etc.

of flow hydraulic lines, hand-operated aircraft pumps, a large variety of aircraft oil tanks, including altititude tanks which maintain a steady flow of oil to the engine regardless of pitch attitude, and altimeter fuel tank exchangers.

COSSOR ENGINEERS MOVE THE ALPS



Thirteen 40-mile range PPI photomultiplier were taken on the Coscor Artillery Control Radar with VI were installed at Zurich, Switzerland. Then on the left is the main radar display. The other PPI (right) shows clearly the effectiveness of the Coscor developed PERMANENT ECHO CANCELLATION circuit, the moving aircraft responses previously obscured are now revealed. Measurements taken as such as a based in Switzerland, with extensive ground sources, has indicated that a night radar for radar operators. Coscor engineers develop an advanced development of the best and have produced the most complete radar—over 100,000,000.



COSSOR ARTILLERY SURVEILLANCE RADAR (see p. 95) A view of the installation at the Zurich Airport.



COSSOR

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STUDY PURPOSE
 To determine the prevalence of
 114 National, Post-Market, Survey
 711 Secondary, Whistle-Blower, Survey
 624 Internal, In-Depth, Interview



Panel Combines Gear Controls, Indicators

A composite landing gear control panel that gathers controls and indicators into one package has been developed by Avionics Products Engineering Corp. The unit was designed to meet standard cockpit requirements and is intended for instrument panel installation.

Leading gun control handle is easy to identify because of its wheel-shaped knob. The panel contains a red warning light to indicate unsafe condition as that leading gun is not consistent with handle position.

The panel also includes a solenoid-operated lock to prevent unauthorized gas refraction while the unit is on the ground, an override button for the solenoid lock, and a push button to test the warning lights.

Rear front of the panel is internally lighted in accordance with specification MIL-P-7765 and all electrical terminals at the back of the panel are standard AN connection. The panel houses all switches and associated mechanisms.

Dimensions: width— $3\frac{1}{2}$ in.; height— $6\frac{1}{2}$ in.; depth—3 in. Newcombton Model 4481.

Address: Denver, N. I.

Simulator to be Built For T-37A Trainer

A prototype light trainer for Cessna's new, two-seat trainer the T-17A, is being built by Lear Aviation, Inc., under contract to the USAF, the company announces.

The new simulator will incorporate cockpit motion which Link built into Navy F2H-2 and F2H-3 Banshee simulators where the feature enjoys considerable popularity.

Another innovation on the T-STA simulator is that the instructor will ride in the cockpit with the pilot.

... a propeller pitch control transmission assembly for Beach Aircraft Corporation.

In order for the hydraulic motor to function properly, the tolerances on practically all of the dimensions had to be held to within .001" or .002" for squareness, parallelism, and concentricity.

INDIANA GEAR

INDIANA GEAR WORKS, INC. - INDIANAPOLIS, INDIANA



For data, aerodynamicists often lead (left), discuss effects of conditions changing, discuss on subsonic into supersonic flow transition for variable density characteristics of a supersonic bubble with Richard Bage (center), Lockheed's Experimental Fluid Dynamics Unit, and Aerodynamicsists Ben Brock (right).

AT-44 Vector-Riding Plane
In development, advanced version of current design aircraft



AT-44 Vector-Riding Plane
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AT-44 Vector-Riding Plane
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AT-44 Vector-Riding Plane
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In development, advanced version of current design aircraft



Lockheed
AIRCRAFT CORPORATION
BURBANK **California**

Six Prototypes Show Trend of Lockheed Aerodynamics Progress

Aerodynamics engineers work in a realm of classified security. Their accomplishments become known only when a plane first flies or is declassified—long after the Aerodynamics work is done. That is why Lockheed's six prototypes are so significant to current-minded Aerodynamics Engineers.

Ranging from hovering to supersonic flight, the prototypes individually are aerodynamic subminiatures. Collectively they encompass the versatility and scope of Lockheed's Aerodynamics Staff. They emphasize the creative atmosphere at Lockheed. For each Lockheed activities covering virtually every phase of aerodynamic endeavor, fresh thinking, new ideas are welcomed and rewarded. Moreover, the variety of six prototypes point out the path of Lockheed's Aerodynamics future: significant advances in all phases of aircraft, commercial and military.

AERODYNAMICS GATHER OPPORTUNITIES—This diversified expansion program has created new problems for Aerodynamics at all levels to create superior aircraft designs that fly at extremely high altitudes, mach numbers with rapid onset of supersonic aircraft at low altitudes, develop boundary layer control systems for safe take-off and landing of fighters and transports, create silicon control and fuel storage systems for use in high-speed flight through analysis and design, participate in determining configurations of turbo-prop and jet transport and advanced fighters, interceptors and bombers. Aerodynamics men interested in these problems are invited to write E. W. DeLozier, Dept. A-44-6, for an application book and brochure describing life and work at Lockheed.

AVIATION CALENDAR

- Feb. 11—Air Transport Command, 15th anniversary of World War II efforts. Waldorf Astor Hotel, New York.
- Feb. 20-21—Fourth annual Trans-Arctic and Arctic Conference. AAU/College of Trans. College Station, Tex.
- Feb. 20-21—Institute of Supply, Dealer, trade show and convention. 2176 AA Army, New York.
- Feb. 22-23—National Model Plane Show. Hyattsville, Md.
- Feb. 23-24—International Air Transport Assn. 100-day conference of airlines held in various locations, Kansas Hotel, The Hague.
- Feb. 25-26—Fourth annual Ohio Indiana Agricultural Aviation Conference. Perdue University, Lafayette, Ind.
- Feb. 26-27—Associated Cities Club of Southern California, annual annual Pacific Coast Mail Week. Shoney, Champaign, Ill.
- Mar. 1-10—Institute of the Aeronautical Sciences, National Flight Propulsion Meeting. General Electric Hotel, Cincinnati.
- Mar. 14-15—Society of Automotive Engineers, symposium, meeting, and show. National Plaza, Cincinnati.
- Mar. 14-15—American Society of Test Engineers, 10th Annual Industrial Exposition, Science Auditorium and Convention Hall, Los Angeles.
- Mar. 20-21—Aero Medical Assn., 5th annual meeting. Hotel Statler, Washington, D. C.
- Mar. 21-22—Institute of Radio Engineers, national conference, Waldorf Astor Hotel, New York.
- Mar. 24-Apr. 1—American Society for the 10th Air North Western Model Exposition and Congress. San Francisco Auditorium and Convention Hall, San Francisco.
- Mar. 24-Apr. 1—Institute of Aeronautical Sciences, 10th Annual Symposium on Boundary Layer Effects in Aerodynamics. Institute of National Physical Laboratory, Teddington, England.
- Apr. 27—Radio Technical Commission for Aeronautics, spring meeting and part meeting with the Institute of Radio Engineers, Los Angeles.
- Apr. 29-30—World Flight Fair & Trade Exposition. National Guard Armory, Los Angeles.
- Apr. 30—Aeronautical Chamber Assn., symposium of Private Council International Air Commission, Paris, AFB, Pa.
- Apr. 30-1—American Association of Airport Engineers, 1955 annual convention and business meeting, El Comodoro Hotel, Tucson, Ariz.
- Apr. 31—Institute of Aeronautical Engineers, 10th Annual Aeronautical Meeting, Aeronautical Production Forum, Aircraft Engineering, Dayton, Ohio.
- Apr. 31-1—American Society of Mechanical Engineers, 10th annual symposium, including two aviation sessions, Lord Stirling Hotel, Baltimore.
- Apr. 31-2—American Society, spring meeting, Baltimore.
- Apr. 31-3—Society for Experimental Mechanics, spring meeting, Hotel Statler, Los Angeles.

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If... and when... that aircraft is slotted into the intertypes of Western Europe's radar network, New Yorkers, and indeed all America, had better brace down their harness. It may well be that that premiss message will signal the outbreak of World War III. For those who are not sure, Angels 50 Plus is R.A.F. Jumbo for missile over 30,000 ft. Jumbo could mean anything but the Big Bang, Atom or Hydrogen. It is a Javelin message, but then the R.A.F. is given to understatement.

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Modernization kit to convert Goodrich wheels and single-disk, three-spoke brakes, used on Convair 440, for installation on all Lockheed Lodestar has been approved by Civil Aeronautics Administration.

Special parts modify the wheels to the standard 15.00 x 15 tires and to permit attachment of brake assemblies to Lodestar torque plates. The new installation is said to be capable of more than doubling the available emergency capacity of old-type Lodestar brakes.

Complete conversion kit includes new wheels, brakes, special parts, all necessary AN hardware and installs two disc brakes, but not tires and tubes. Cost \$1,000.

Aircraft Engineering Division, Lutz Inc., Santa Monica, Calif.

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Guided missiles and aircraft can be given protective heating elements by spraying on an inorganic film whose wet density can be engineered to 40 w./sq.in. for voltages from 0 v. to 215 v.

The element's temperature resistance coefficient is such that it provides an excellent heat seal, yet needs no electrical current in many applications.

This is how it is applied:

- An inorganic resistance of 300 to 610 is applied to the metal surface, depending upon electrical requirements.
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AVIATION WEEK'S 22nd ANNUAL "INVENTORY OF AIRPOWER" EDITION—"Airpower in the Age of Peril"—covering every phase of U.S. civil and military aviation, and providing the latest information on foreign airpower, will be published March 14, 1955. Featuring the complete story of the transition from the Korean crisis buildup to the solid industrial and airpower base necessary to meet the requirements of U. S. Policy over the long pull, this important issue will hold significant and lasting interest throughout the aviation world.

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Editorial: 10th Fl., Detroit 26, Mich., 151 Federal Bldg. London E. C. 4, England, 71 Fenchurch Street. Los Angeles 17, Calif., 5211 Wilshire Blvd. Pittsburgh 22, Pa., 701 Olive St. Philadelphia 3, Pa., 1501 and Spruce Sts. San Francisco 4, Calif., 400 The Embarcadero. St. Louis 8, Mo., 600 Market St.

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Two sizes of heavy-duty telescoping steel slides, useful for storage of equipment in aircraft where material must be moved from "in-use" to "storage" positions, are made of close tolerance stampings designed to replace extruded types.

- Universal A-4026-2 is the larger unit, 24 in. long with an 18-in. telescoping travel, and capable of supporting 150-200 lb. load when extended.
- Universal A-4026-2 operates from a spring-action trigger and can carry a 75-150 lb. load extended.



A-4046-2 can support 150-210 lb. load.
General Metal Products, Inc., Alhambra, Calif.

Large Magnesium Plates Ready for Plane Tooling

Low-cost, rolled magnesium plate is now available from one-quarter to three inch thicknesses and runs up to 6 ft. wide by 24 ft. long for aircraft tooling and product manufacture. Plates are used to be taken three or other sizes made with tooling methods.

Some of the uses suggested for the magnesium plate, checking fixtures, base and pipe, assembly and locating pins, fixtures and heavy adhesive bonding fixtures and vibration test fixtures. Other applications include contact boards, stretch frame blocks, aluminum contact bases for master plates, models

for blown glass and plastic parts and bases for plastic stretch blocks.

The manufacturer's new rolling and extrusion process facilities at Melrose, Ill., having a total annual casting capacity of almost 7 million lbs. annually, have made it possible to bring down prices, the company reports.

Dew Chemical Co., Magnesium Dept., Melrose, Ill.

Small Blower Will Cool Aircraft Electronic Gear

A new blower weighing 20 oz. is available for cooling airborne electronic equipment. The unit has a 1 1/2-in. fan and is rated at 50 cfm at 1 in. of water static pressure.

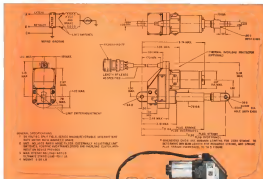
Designed to meet all applicable airframe environment specs, the unit operates directly from a 115-v. 40-cycle line in conjunction with a plating of stainless steel.

Measurements: 1 1/2 in. wide, 3 1/2 in. high and 5 1/2 in. long.

Serviceaircraft, Inc., Components Division, 515 Main St., Westbury, N. Y.

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been placed on the market by Carter-Wright Corp. C-W will produce gauges designed by Dr. Leifeldt & Co., West Germany.

Of particular interest are these five new units:

- **Defect drill** employs an abrasive suspended in a liquid and distributed over the cutting peripheral in a thin film. The unit's transducer emits 15,000 vibrations per second, cutting holes of any shape, on surface hole intricate, C-W says. Upon completion, the surface requires little or no finishing and the unit adds to close tolerances.

- **Fast washer** quickly separates parts from large or small pieces and is especially suited to cleaning jewel bearings, ball bearings and gears. Parts are placed in a container where the ultrasonic vibrations shake the dirt loose without affecting the parts, for easy part repair.

- **Laboratory unit** consists of an ultrasonic generator having a variety of accessories to permit testing of different products and is useful in welding and new techniques or formulas with solutions, according to Carter-Wright.

- **Echoscopes** is useful in quality control work when non-destructive testing is desired. The device has a mobile soundhead which can be used to spot internal cracks in parts made in a

large variety of materials. Ultrasonic impulses are reflected by the hidden flaws and transmitted to a visual cathode-ray tube indicating the position and depth of the defect.

- **Solderometer** points out flaws in metals, glass, rubber, concrete and other solids using a transmitter and a transmitting and receiving soundhead. Defects are acknowledged by a reduction in ultrasonic volume, transmitted to the receiver. It can handle items as small and fine as wires and also giant forgings, says C-W.

Carter-Wright Corp., Wood-Ridge, N. J.

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GFE Coordinated Precision Technology operates in all areas in research, development and manufacture. The record of the GFE Producing Companies in solving advanced technological problems and meeting the demands for high speed, precision, reliability, light weight and compactness at competitive prices is the result of this coordination, the constant application of the newest and most highly advanced techniques, and unswerving insistence on highest quality.

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CAR Report on Crash That Killed 13

THE ACCIDENT

A Bonall Airways DC-3, N 64851, crashed in a farm field approximately 1/2 mile north of the airport at Mason City, Iowa, on 8/29/47, Aug. 21, 1944. Two of the 16 passengers aboard, were killed and six received serious injuries. Of the crew of three, the captain and first officer were killed, and the stewardess was seriously injured. The aircraft was disintegrated by ground impact.

HISTORY OF THE FLIGHT

Bozell Airways Flight 151 at Aug. 21, 1914, was a daily scheduled flight between Memphis, Tenn., and Minneapolis, Minn., with intermediate stops at Little Rock and Fort Smith, Ark.; St. Louis and Tulsa, Okla.; Kansas City, Mo.; Des Moines, Wyo.; and Mason City, Iowa, Austin and Rockford, Ill.

Flight 112 departed Memphis, Tenn., at approximately 0633 and the flight to Kansas City, Mo., including all scheduled stops, was routine. The flight departed Kansas City at approximately 1412 after a flight crew change, consisting of Capt. Wes Fickering, First Officer Wes, White, and Instructor E. A. Tully.

The two separately to Den Molay and Witches, Iowa, were making in all respects. Flight 212 canceled its IFR clearance before each diversion, proceeding VFR to the next scheduled stop.

Flight 152 was off the ground at Waterbury, Conn., at 1811 with a gross load of 14,768 lb., 600 lb. less than the maximum weight allowable. The Waterbury DEP also was not able to change to VFR before the takeoff.

Shortly before 1700, Flight 151 was observed on its usual northwest course, but at a lower altitude, about 12 miles south-southeast of the Miami City Airport. This ground witness observed the B-57 make a left turn over his farm and proceed almost directly west toward a light spot in

5. Snow-birds. At Flight 112 headed west at an altitude estimated by several observers as 400 to 500 feet above the ground, it was observed to enter and disappear in the floodplain approximately 1 mile east of where the wreckage was later found. The track measured approximately 2 miles west of where the left hand wing was found.

Eleven survivors were killed, a twelfth died several days later in a hospital and the seven survivors received serious injuries. Five died and seven others injured.

ESTIMATIONS

The location of the crash is 14 miles south of the Mason City, Iowa, Airport, the destination of Flight 152. The landing

U.S. Navy medical facilities are critical standard fare and are found in the 24-hour clock.

of the aircraft at the time of impact was 210° True. The time of the crash was established at 1730 by an engine-stopped aircraft clock on the instrument panel. Cannon marks at the killed suspect road indicated a level forest and hilly/wooded stratum, pine and fage dominated, with considerable downward air velocity. A low forward speed was indicated by the short distance (40 ft) that the aircraft stopped beyond where the initial impact.

The critically damaged condition of the bottom of the sails and main section substantiated the local aircraft stranding and high sailing velocity. Both wings, outboard of the strake angle, were actually as damaged. The dollar boom on the leading edge of both wings were undamaged and both suspension lights at the wing tips were intact and in place. The left wing tip was distorted downward at an angle of approximately 18 deg. and there were no apparent cracks in the structure. Both wings were aligned in the tip-to-tip chord alignment.

The support legs of the cabin stairs showed suspension bolts, further substantiating the high stalling velocity at initial impact.

No evidence was found to indicate power or structural failure, or malfunctioning of any aircraft control or component prior to impact. Settings and condition of the propeller blades indicated approximately cruise power at impact. All aircraft safety equipment was bench tested and found to function normally. The disturbed setting of the VOR# receiver near 12450 megacycles which is the Miami City VOR frequency. Examination determined the cause: selection of the VOR# to be 131 day, which is the VOR# approach heading for Miami City (Miami).

Investigation disclosed that the flight crew was thoroughly familiar with the route. The captain had flown for Braniff and a professional company, regularly won the preferred route for more than 10 years at the same time of aircraft involved in this accident. The first officer, previous to his employment by Braniff, had flown extensively in the Mexico City area.

Investigation disclosed that company dispatching procedures were complied with and the operation of Flight 152 was a departing aircraft was entirely normal.

The course from Waterloo, Iowa, to Miami City, Iowa, is an authorized landing and the air distance is 83 miles. Ground warnings applied to visual flight rules weather conditions and no severe icing was in effect when Flight 152 attained cruise and proceeded westward towards a lighter spot in the clouds.

Seven minutes after Flight 181 departed Waterloo, Iowa, at 1601 a heavy thunderstorm was over the Mason City Airport and extending southwest. The Mason City Sheriff's office operator at that time was un-

Friday, 14th November 2008

able to contact Flight 151 and reported
Board Flight 148 southbound from Mesa
Airport and the Watson company radio
to advise Mesa City weather to the flight.
Flight 148 complied with the request and
received acknowledgment of the message.
At 1035 direct radio contact between Mes-
sa City company radio and the flight was
established and at that time the flight ad-
vised it would hold southeast of Mesa
City due to thunderstorms to the west and
northwest.

Approximately 20 pines along the east-west line between the left turn and creek point (if asked were questioned as to their observations of the aircraft and weather conditions). The consensus of these witnesses was that a vapour stream was in the area in the vicinity of an elevated altitude above the ground of 400 to 500 feet. One witness saw them and disappeared into the lighter spot in the centre of the clouds. The witness witness, 1 mile east of the crash, was in heavy rain immediately after the aircraft crashed, overhead.

[illegible]

A pilot of a Beech Bonanza, on a flight down the Omaha Neb., area to Mason City encountered the worst edge of the thunderstorm at about the same time that Flight 171 entered from the east. By holding southwest of Mason City for a short period, the aircraft avoided NVR and landed



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SAFETY

request from TWA, AF, Cals. These aircraft are maintained on an Air Force Airplane and the Weather Bureau has a contract with the Weather Bureau for maintenance of the Weather Bureau and the Weather Bureau. On Aug. 21, 1964, the Air Force issued two severe weather advisories, perkins to the South Dakota, Nebraska, Minnesota, and Iowa area, one at 0700 and one at 1414, forecasting heavy thunderstorms, gusts to 50 knots, scattered to heavy showers and several tornadoes in thunderstorm. This last advisory forecast a line of thunderstorms that would have been 60 miles west of Miami City at 1700.

Reiter from detection observation in 1700. The AF's air of severe weather conditions were reported approximately with the Weather Bureau's observation for heavy turbulence.

normally available from the Weather Bureau at Des Moines but the equipment was inoperative for 34 hours before the accident, subsequently advised from that same time and available for use by Flight 152.

ANALYSIS

The flight's estimated time on arrival Western-Maine City was 21 minutes for the 65 mile flight, a ground speed of 114 mph. At the point where the left turn to the west was made, 40 miles, or 17 miles west of the airport had been flown and the approximate time of the turn would be 1400. This is the time that the flight of 152 was in a position to have been in Miami City. It is 11 miles, or 11 minutes, from where the turn was made to the crash point, making an overall time of 1701 at the crash point.

The small time discrepancy between 1701 and 1703 can be explained by the probable reduced altitude, due to the adverse turbulence reported by Flight 152 in the last 3 minutes of flight.

From the above it is evident that Flight 152 did not hold southeast of Miami City any appreciable time. Although this is not the case, it is evident that the flight could not be accurately depicted, several minutes estimated its height, as 500 to 600 feet above the ground. The reason why the flight proceeded into the thunderstorm area at this low altitude rather than hold clear of the storm was only be ascertained. It is possible that the captain had received many similar opposing storm during his years of experience over the south and it is quite possible that he entered the lighter side between the darker clouds on the north in order to get on the back side of the storm and subsequently land at Miami City.

At about the time the flight left Miami City the previously reported storming conditions had developed into thunderstorms scattered near the state but not forming into a true squall line. One of these thunderstorms was located to the southwest of Miami City and moved southeast to the Miami City Airport at 1440. For this thunderstorm building, progress rapidly to the southeast end of the development with one or more thunderstorms colliding the surface layer was not steps at about the time Flight 152 arrived at the west of the accident.

The flight area that ground conditions stated Flight 152 flew into can be accounted for by the lighter color of the rain clouds in contrast to the darker clouds above and on either side. By this time the flight was into the light and the rain was very heavy and a downdraft had been established.

It is clear that a very strong downdraft developed in this area. Substantiation for this strong, gusty wind is shown by the damage done to these roads in the area of the accident and most of the gates were blown closed to the north.

In the initial stage of a downdraft of this nature the strong downward component is confined to the surface and it is possible that Flight 152 penetrated the



Continued from page 10

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stems in the initial stage of the development. Further contributing to the loss of altitude is the possibility of a sudden upsurge, but the launch personnel into the divergent winds from the storm center.

Extensive investigations were conducted with regard to possible fatalities, but it can be definitely stated that a fully developed tornado touching the ground did not occur. There is insufficient evidence to state whether a vortex did or did not. With regard to the storm, had the data set at the Miami base in question it would not have been capable of determining the intensity of the storm due to the distance being beyond its effective range. Radar station detection information could have been provided for the Air Force station at Woomera (approximately 40 miles from the scene of the accident) had the pilot of Flight 131 requested such service.

The Weather Bureau's forecast for Mexico City, Texas, did not contain information that would properly warn the pilot of conditions that would be encountered, and it is the view of the company forecast. If the storm that developed near Miami City had been anticipated by the forecast, a more weather forecast would have been required.

FINDINGS

On the basis of all available evidence the Board finds that:

1. The flight crew, aircraft and air carrier were normally certified for the subject flight operation.

2. According to company records the aircraft's fuel was properly distributed so that the center of gravity of the aircraft was within approved limits.

3. There was no evidence of structural or power failure or indication of control or communication prior to impact.

4. The dispatching of the flight was normal and in accordance with company procedures.

5. The flight showed that it would hold southeast of Miami City.

6. The flight was observed to enter and disappear in a thunderstorm.

7. The crash occurred in an area where severe storm gusts would occur.

8. The U. S. Weather Bureau at Miami City reported the U. S. Air Force was in greater information but considered their forecast in effect of the time to be adequate.

9. The weather forecast issued by the Weather Bureau and Bureau did not take into account the severity of the storm that was encountered.

REMARKS CAUSE

The Board determines that the probable cause of the accident was that the flight while endeavoring to become a thunder storm area encountered very heavy rain, divergent winds, and strong downdrafts that forced the aircraft to the ground.

By the Civil Aeronautics Board.

Chris Gentry
Harold D. Denny
Donald Ryan
John Lee
Joseph E. Adams

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AIR TRANSPORT

CAB's 2-1 Vote Dims Nonsked's Hopes

- Split Board says compliance ruling should precede decision on North American N. Y.-Chicago route plan.
- Josh Lee's dissent hits at long delays in processing route case, but does not support carrier's application.

By Craig Lewis

Attempts by North American Airlines to get a decision on the New York-Chicago case ahead of action in its own compliance case are an indication that the nonaligned carrier is expecting a likely, Civil Aeronautics Board ruling.

In denying a North American suit, the Board said that the carrier's claims must be "based on the assumption that it has been operating illegally and can be legally required to terminate its operations."

Cost. Action-North American has continued with petitions to the Court of Appeals to stay the Board's action and receive the case.

The substance centers on the issue of which of two cases—the New York-Chicago service case and the Transatlantic Canada Air Lines compliance proceeding—should get priority in the issuance of compliance orders. Both cases are being handled by executive William F. Cantak. North American wants the New York-Chicago case decided before the compliance proceeding. The Board has decided to go ahead with the compliance case.

CAB members Joseph F. Adams and Josh Lee held the opinion that the New York-Chicago case has been held up long enough.

The New York-Chicago case is a general issue in which North American is an applicant for certification as a regular air carrier between the two points. The compliance proceeding deals with alleged violations of its operating authority by North American and could result in the complete carrier being put out of business.

Lee Dissents. The Board decision came as a result of a North American petition for reconsideration. Since November, the board has been petitioning executive Cantak and the Board to have a report issued on New York-Chicago before the compliance report. On Jan. 7, the four-member CAB split evenly and the petition failed for lack of a majority.

North American filed for reconsideration, and the Board has issued the carrier down by a 2-1 vote, with Lee filing a dissent.

It is understood that CAB member Adams withdrew from participation in the matter, with the result that there was a clearcut majority decision. The dissenting votes were cast in Lee's favor.

No Suspense. Despite the North American suit, the United States Court of Appeals to review the action and has also asked for a temporary restraining order to stay the effectiveness of the Board's order. CAB has agreed to take no action until the hearing on the temporary injunction, scheduled to be held this week.

In denying the motion for reconsideration, the Board said that since decisions issued by executive Cantak first, North American can't go to the court to get a temporary restraining order to stay the effectiveness of the compliance action.

The majority also found that the carrier should give priority to the compliance case because:

- The carrier has not had the time to prepare an answer to the court's order of jurisdiction and "the immediate handling and proper disposal of the Board's business and the cost of public will be saved."

- By having the carrier's compliance report before the compliance case, the Board can make a decision on the compliance case more quickly.

- The Board said that it is also imperative to expedite enforcement proceedings in order to maintain the effectiveness of enforcement action and the Civil Aeronautics Board's authority.

- North American Views. The individual and representative which make up the North American group want the court to act under the CAB order, not under the court's order. The group is to come out first and petition the Board and the carrier then taking any action until the court reaches a decision.

- In support of these requests, the association has filed a petition.

- CAB was in assigning both cases to the same committee.
- CAB was wrong in offering a situation where an executive "was first" to "set" one case submitted to him for

consideration, as the New York-Chicago service case, while the compliance case was delayed.

- CAB should have taken direct action to sustain the carrier which case to consider first.

North American holds that the Board's order is erroneous and unlawful in supporting to approve these actions in law. It also says that the CAB action was "arbitrary, capricious, unlawful and in abuse of respondent's administrative discretion" in failing to consider the rights of the petitioners to have the cases disposed of in a modified order.

The brief to the court says that the Board made the improper assumption that North American had a duty to submit the question of priority and that it had failed in its duty to expedite certain cases.

The Board order is claimed by North American to be "prejudicial and founded on a completely erroneous analysis of petitioner's conduct," and to be "enforced and void because it was adopted 'not only three members participating although no carrier is given who the fourth member failed to participate'."

- Lee's Views. CAB member Josh Lee opposes the majority action, as he has done in the case of North American. He says it is an error in the processing of the New York-Chicago case is contrary to the public interest.

- Lee, believe it is in the public interest to wait for the compliance report before enforcement proceedings where it is necessary to promote and further the objectives of the Civil Aeronautics Act. That it also believes it is in the public interest to wait for the compliance report before enforcement proceedings where it is necessary to promote and further the objectives of the Civil Aeronautics Act.

- Lee observed that the Board has been ordered for compliance but is getting cases started and in getting them handled once they are under way. He pointed out that the United Air Lines' restriction on, dealing with CAB's meeting between Chicago and the Northwest, was delayed more than two years ago pending action on the New York-Chicago case and is still being used for delay.

- Delay Concerns. Lee reviewed the proceedings in the New York-Chicago case, stating that two years have gone by since the preliminary conference and 11 months since hearings closed, and en-

Airwork Leases Slick Planes for U.S. Route

With less than a month to go before it is scheduled to start from Atlanta its cargo service, Airways Ltd. has now found some airplanes. The British company signed an agreement with Slick Airways for an individual contract of DC-6s and C-54 transports.

Slick Co., Geneva-Slick has filed an agreement with Civil Aeronautics Board that says the U.S. carrier will provide aircraft and crew, with no action allowing Airways to supply its own crew as they see fit.

After earlier to Slick, Airways hopes to use its own crew as it is possible in order to check them out before the carrier starts delivery on its own DC-6s from Douglas Aircraft Co.

Under the new, second of U.S. registry cannot be operated by pilots who do not have U.S. transit certificates. Air work performed for and has been granted a number of other airlines of the Civil Air Administration relating to requirements for pilots, navigators and flight engineers for certification.

Training leaders-CAB is granting U.S. certificates, provided the British airline has a certificate issued in the United Kingdom. Such a certificate will be valid only in operation of U.S.-registered aircraft employed in the service authorized by Airways's foreign carrier permit.

Such conditions will become effective, however, only after the Slick-Airways agreement has been approved by CAB as the Board issues a statement to the effect that approval is not necessary.

CAB approved the pilot certification basis, deciding on the agreement that it is to permit to allow Airways from the border and export of foreign air crew to pass U.S. international. The Board explained that it is not permitting a decision on the actual agreement.

CAB Examiner Backs Rival Lines in Hawaii

Competitive air transportation will continue in the Hawaiian Islands if recommendations by Civil Aeronautics Board examiner Merritt Kallen are adopted.

His report recommends that:

- **Trans Pacific Airlines' temporary certificate** be renewed for five years, to expire January Dec. 31, 1975.

- **Hawaiian Airlines' certificate** be amended to include service to Hilo, Maui and Kona.

- **Colonial Airlines and Andover Flying Service** be permitted to operate as passenger carriers in the near future, as they are applied in the continental United States.

Chief issue in the case is whether

Trans Pacific should continue to operate as an inter-island carrier in competition with Hawaiian. TPA started operations in 1949 and, by 1952, was flying 51.3% of the revenue passenger-miles in island traffic. When Hawaiian, which started operations in 1959, added Caravelle 440s to its DC-3 fleet in 1963, TPA's share dropped. But it has recovered.

In view of the relatively short distances involved, Hawaiian does not rely substantially on service on island routes as far as safety, comfort and speed are concerned, according to the report.

Kallen estimates that current total island pay costs for the two airlines will be \$100,000 more than for a single carrier, but says he feels lines in the United States get considerably more and pay far smaller sums.

The report says Hawaiian presents an unusual problem. There is no other type of transportation available to compete with its service. "In Hawaii you can use the airline or you don't travel," Under these circumstances, the examiner believes that "some subsidy is justified to prevent a complete monopoly of all transportation facilities between the Hawaiian Islands."



Fast Factfinder

American Airlines' ticket agent says can give its pilots flight information only amounts after a query is asked. A Hilo-based member of the Hawaiian Islands Service Committee and committee, headed up to the agent's act, does the job. The ticket book lists flight data into the Hawaiian Islands' airports "necessary" data. An agent has only to key in to the flight in question, then give true history. The Board was asked the answer back to the act. The airline has 127 of the number sites in its inter-island and hotel offers through out the New York metropolitan area. At the same time, one of the Hawaiian Islands' inter-island carrier around the country, it will be the new flight information data into it.

Charter Market

- **IMATA survey shows need for air exchange.**

- **Association says traffic would increase 100%.**

There is a large potential market for charter service in the U.S., according to a nationwide survey of typical charter users by the International Air Transport Association.

IMATA says its survey shows that establishment of an air exchange, or commercial clearing house of some sort, would help to increase commercial air charter traffic by as much as 100% among current users.

It says current users have an opportunity for exploiting potential traffic.

- **Basic Need**—In its survey, IMATA said defined questionnaire to three varying groups—pilots and aircraft owners, charter operators, and business and industrial organizations. Responses were received from 56% of 1,801 organizations polled.

- **Of charterers**, 41.2% had had charter service in the past year, and the past two years, indicating increase, 17.7%, indicating, 5.6%.

IMATA says the basic need for an air exchange service, similar to the one previously operated by IMATA for the airlines, was revealed as answer to questions relating to the difficulty of obtaining service for charter. Nearly half the companies had reservations using charter service in the past year at one time or another, but were unable to locate an available plane of the right type when needed. Of industrial concerns, 15% had charter facilities.

- **High Prices**—According to IMATA, three were the reasons most often given for failure to use charter service:

- No aircraft of any size available
- Price too high, especially because of servicing at destination
- Available aircraft not suitable

"These are factors," says Raulo D. Potts, Jr., IMATA president, "which can be largely eliminated through the coordinated action of an air exchange. It is apparent from our study that the charter market demands a wide variety of equipment, from single-engine to the largest and most modern four-engine jets."

- **Access**—There are frustrating access demands and a geographic barrier to airports. "It would be difficult, if not out of the question, for even the largest single carrier to meet the diverse needs of the business to develop its own common product."

- **Single, Demand**—Potts says that by bringing together information on avail-

ability of aircraft and aircraft requirements in one coordinating group, demand and supply can be matched. That, he says, would result in improved service, elimination of empty ferry flights, and waiting time and substantially lower costs to the user.

- **Use**—As to likely charter reduction in heavy cargo and short-haul cargo for military cargo would make it possible to single group could be established to serve both military and commercial charter needs.

- **New Nation**—One of the most significant facts uncovered in the survey, the IMATA chief says, is that "charter business is very largely new business for airlines. For example, if officials had to find a substitute for air charter, 75% would choose charter transportation; only 25% would use scheduled air transport."

"Individuals and associations would use scheduled air transportation to a higher degree. However, 11% of the individuals would choose their own, and 36% would use charter transportation. Air charter fills a specialized need, and its potential users exceed the number of those who already have air charter."

Los Angeles Asks Mexico City Service

United States-Mexico air service took another turn when Sen. Thomas H. Kuchel asked the State Department to permit air service between Los Angeles and Mexico City by an American carrier.

In a letter to Thomas H. Kuchel, Assistant Secretary of State, Kuchel asked that Los Angeles-Mexico City service get priority over negotiations between the two governments, reported state to agencies.

- **Inconvenience**—Kuchel said the U.S. should make every effort to obtain equality of treatment in the airline market to the principle of reciprocity. "Mexico's refusal to allow an American-owned line to operate between Los Angeles and Mexico City is not to the best interests of our own country. Steps should now be taken rapidly to rectify this state of our nation."

- **Civil Aeronautics Board** gave Western Air Lines a permit in 1946, but the route never was operated because no agreement was reached with Mexico, either as an individual basis or as a bilateral.

The inquiry involving branches of thousands of its travelers in the western half of the United States is dangerous to be continued," said Kuchel, "before any speaker or additional service is arranged for those portions of this country now already enjoying state-of-the-art and low-cost commercial service."

boast with Mexico." Proceedings are under way in CAB to certificate a U.S. carrier for nonstop New York-Mexico City service.

- **Mexico's Application**—In the country New York-Mexico City route light, another factor came into focus when American Coast, S.A., renewed its offer to get a permit for the service. Kuchel, it was reported, that Congressmen Menendez and Arroyo, S.A., had the route track to American Mexico in the service (Aeronautics Week Jan. 16, p. 9).

Grant would a permit to operate between Miami and Mexico. In 1947, the airline applied for a permit for New York-Mexico City service service after obtaining rights for the route from the U.S. national government.

- **Alcohol**—Kuchel has made an attempt to expedite its application, but the Board has followed a general policy of not considering route applications for U.S. Mexico service because of the absence of a U.S. carrier.

The Board is now actively promoting the application of Eastern Air Lines American Airlines and Pan American World Airways for the service service.

"Current regulations that CAB is ready to consider a Mexico airline and points out that the Mexican government probably will want a Mexican carrier certificated in exchange for our right to operate a U.S. line. That the airline suggests that application has not in its application would be in the interest of any institution of nonstop service, since it already is the Mexican carrier with passenger service."

"Grant now a 'no' concern with the same as the New York-Mexico City service case as to which, if true, of the three U.S. carrier participants should be considered the most likely to operate the route. Applicant believes, however, that the same factors which warranted the consideration of the granting of the route to our United States carrier Kuchel would warrant the consideration of the granting of the route to the Mexican carrier which, since 1947, has held the Mexican authority to operate the route."

Board Approves New EAL, Piedmont Routes

Civil Aeronautics Board has decided to supplement service through Ohio by certifying Eastern Air Lines from Charlotte, N.C. to Detroit and Piedmont Aviation from Charleston, W. Va. to Columbus.

Eastern's route is segment of Route 6, according to an historic service between Charlotte and Detroit via intermediate points Columbus and Toledo, Ohio. Piedmont will operate new service between Charleston and Columbus via

intermediate point Parkersburg, W. Va. Martinsburg, Ohio.

Like Colonel Airlines added for Delta Continental service via Columbus, Detroit and Toledo, but the Board decided its application offered insufficient evidence to warrant certification of that route.

Eastern stated its new segment to improve the service between the Charlotte. The Board said that its decision to amend Piedmont and Eastern's certificate "is based on our view that such action will reduce the lack of the benefits of the service provided by both of these carriers, and at the same time will operate to minimize Piedmont's subsidy requirements."

CAB ORDERS

(Jan. 29, 1975)

GRANTED

The Piedmont General Order to enter into the new operating Western Air Lines service to Richmond and St. Charles, Va., and Charlotte, N.C.

APPROVED

Transfer of certificate of Main Airways to Howard J. May.

Interagency agreement involving Delta, CAB Air Lines, Federal Airways and various other carriers.

ORDERED

Investigation and suspension of certain charter users from DC and C-47 type aircraft that by General Airways.

Amendment of certificate of certain scheduled lines filed by Great Lakes Airlines.

DENIED

California Central Airlines' petition for reconsideration of an earlier CAB decision denying its application for a new route between Los Angeles and San Francisco.

REMARKS

When California Central's application for a license to operate service between the Hawaiian Islands and Honolulu, since the application has been withdrawn.

SHORTLINES

- **American Airlines** will start a second daily service, connecting flight between Los Angeles and Washington Mar. 1. It is scheduled for 8 a.m. 20 min. westbound, 6 a.m. 18 min. eastbound.

- **United Air Lines** has bought 32 million in airborne radio equipment for its aircraft. The purchase includes 214 very high frequency receivers and the same number of VHF transmitters. . . United expects it will spend \$3-million south and south in 1975.

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See page 43 in this issue for other positions.

All replies confidential.

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Losing the Technical Race To Russian Manpower

The voice of Dr. Hagl L. Dryden, director of the National Advisory Committee for Aeronautics, is the latest in a long list of eminent scientists to be used in protest over the lack of technically trained scientists being educated annually in this country. Dr. Dryden cites statistics showing U.S. technical schools will graduate between 20,000 and 25,000 persons during 1955 while Russia will provide similar technical training for nearly 100,000.

"Obviously if you sit and you out Russia it to give technical training to four times as many young men as we do, we cannot hope to maintain for long our present lead in aeronautics," says Dr. Dryden. "That is the most serious of the problems of high-speed flight which we face at the moment today."

How many other voices will later join this chorus before industry, government and education will combine forces for an effective solution to this problem?

Required Reading On Air Strategy

The technological revolution in aircraft and rocket weapons has moved so rapidly that military strategy, tactics and organization are still far behind. In the months ahead we face a long and bitter debate in the Pentagon, on Capitol Hill and from public criticism on new strategy, tactics and organization designed to fit and fully exploit the current and future capabilities of atomic weapons. This debate will affect profoundly the life of the American people, from their chances for survival to the kind of the tax burden they must carry. It is already apparent that the revolutionary technology of atomic weapons is ending the foundations of traditional military organizations such as the Army and Navy and that even a selective new service such as the Air Force will not be immune from the ideas it is generating.

As a primer for the study of this debate and the problems it will try to settle, we recommend reading two articles published in recent weeks by young former USAF officers now in civilian careers. They are "Counter Force Strategy" by T. F. Wallowicz in the February issue of *Air Force magazine*, "Teddy" Wallowicz is a former USAF lieutenant colonel now a consultant to Lawrence Rockefeller and is well known to the aircraft industry for his USAF activities in research and development.

"No Need to Bomb Cities to Win War" by Richard S. Lighow in *U.S. News and World Report's* issue of Jan. 28. Lighow is a colonel in USAF Reserve, was a World War II pilot and Pentagon planner until 1953 and now works for Eastman Kodak Co.

Both of these articles read the moral, political and military bankruptcy of the "massive retaliation" policy as it is now interpreted and echo the growing military opinion that any effective employment of atomic weapons must be against military targets rather than against populations in open cities. This concept was first voiced in 1951 by Gen. Nathan F. Twiss, USAF Chief of Staff, and James Harold Doolittle, USAF Reserve lieutenant general and military planner and operator extraordinary.

The debate on the future strategy, tactics and organization of atomic weapons should be followed closely by every American citizen, including those in the aircraft industry, because it will determine what type of equipment must be built and to whom it will be sold.

USAF's New Plane Book Offers Useful Data

The latest edition of "Reliable Information on U.S. Air Force Aircraft" should prove useful to aircraft industry executives. It is compiled by the USAF contractor in the Security and Review Branch of the Public Information Office of the Secretary of Defense. This group, headed by Lt. Col. George Schenck, does a creditable job of serving both industry and press within the limitations imposed by national policies from higher Pentagon authority.

These reliable aircraft data is presented between hand covers that are covered in well-read film, often good three-view drawings of many aircraft, and makes a genuine attempt to include all generalized performance data and detailed discussion possible. There also is a handy blank page under each aircraft where additional data can be recorded as it becomes available. There are some style oddities and omissions that will occasion comment. For example, the Northrop Star is designated B-62 while the Bell X-5 is labeled X-57, despite the fact the X-5 is much more advanced in development and closer to operational use than the Star.

When security restrictions prevent the X-5's power plant from being identified as the same three-horsepower rocket motor released publicly in Bell's annual report for 1953 bulletin set. Since atomic developments were being included, the omission of the North American B-64 Navaho also is puzzling, since it has been part of other USAF public lists.

If readers wonder why the range and gross weight of the Douglas RB-66 and B-66 twin jet bombers are omitted from this data book, they may ponder the fact that the USAF version of this design weighs considerably more and have much less range than the A-1D version built by Douglas for the Navy.

All in all, the USAF aircraft publication is a step in the right direction and will be helpful to all who use it.

—Robert Hertz

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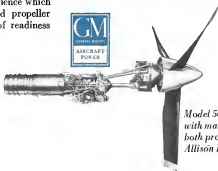
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